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*The*  
**Coal Mining Industry**  
*of the*  
**Far Eastern Republic**

*Soviet eastern industry*



Published by  
**The Special Delegation of the Far Eastern Republic  
to the United States of America**

Washington, D. C.

1922



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## I.

# THE COAL MINING INDUSTRY OF THE ZAIBAIKAL AND PRIBAIKAL PROVINCES

In Zabaikal and Pribaikal there are available deposits of brown coal only; real hard coal has not been discovered there as yet.

Brown coal is very widely spread over the territory of this region; there are deposits of it at Lake Baikal and further east in the valleys of the rivers Khilok, Chikoy and Uda, and further, beyond the Yablonov mountain ridge, along the valleys of the rivers Ingoda and Shilka, and further, towards the borders of Manchuria, in the steppes of Dauria.

All the deposits of brown coal which are considered as lake deposits have the character of separate basin-shaped coal-beds, which do not lie at great depths, which facilitates their extraction by rendering possible, in many of these deposits, the so-called open work, i.e., it renders possible a complete removal of all the layers covering the coal, and afterwards a complete removal of the entire thickness without using any special supports for this purpose.

The deposits along the rivers Chikoy and Uda, being remote from the railroad, are at present of no importance industrially, and are therefore completely unexplored. The presence of these is known because of the numerous outcrops of deposits of brown coal in the valleys of the aforementioned rivers.

For this reason the present description is concerned only with the deposits situated near the railroads, which are well explored and are now either being or have recently been exploited.

### Demand for Coal

A demand for coal in these provinces appeared in the be-

ginning of the nineties, immediately after the construction of the Transbaikal Railroad.

At first the railroad was practically the only consumer of the local coal as at that time there were practically no other branches of industry except the production of gold and the extraction and working of certain ores; and those in operation were using wood as fuel. But as the population of the country increased and the cities grew larger, there arose a great need for coal for the use of the municipal establishments (electric light for the railroad stations, waterworks, etc.), as well as for private establishments, steam flour-mills, leather and cement works, match factories, etc., whose development was greatly stimulated after the construction of the Transbaikal railroad.

As the main purpose of the brown coal mines was to supply the Transbaikal railroad with coal they were established exclusively near the railroad and at approximately equal intervals, their aim being to supply definite sections of the railroad, thus rendering superfluous the transport of the coal over long distances.

### The Main Coal Establishments

Thus were originated the mines in the western district:

The mines of Tarbagatai (at the 37th siding of the Transbaikal Railroad, 634 versts (1 verst 2-3 miles) from Irkutsk; the mines of Khaliartin (12 versts from Tolbaga Station and 17 versts from the Tarbagatai mines). On the middle section of the Transbaikal railroad there are the Chernosk mines—at a distance of 20 versts west of Chita, and 964 versts from Irkutsk. The eastern sections of the Transbaikal railroad: the mines of Kholbon and, side by side with them, the Arbagar mines—at a distance of 18 versts to the southwest of the city of Nerchinsk, and 250 versts from the city of Chita, on the Sretensk branch line, and the Kharanorsk mines at a distance of 280 versts from Chita on the main line of the Transbaikal railroad, towards Manchuria—at a distance of 18 versts to the west of the station of Borzia.

Working principally for the railway, the coal companies may be said to have been maintained exclusively by the Transbaikal Railway and to a great extent to have depended upon it. The size of the orders from the Transbaikal Railway, in fact,

became the deciding factor for a coal mine, and those among them that could not supply coal of the same quality as other neighboring companies, or at the lowest prices, could not exist and had to discontinue operation; in this way, the Kharliartin coal mines, which opened in 1912, were closed two years later; on account of the hauling distance (8 versts to siding No. 39, and 12 versts to the station of Tolbaga), they were unable to compete with the Tarbagatai coal, in spite of the favorable conditions for the production of Khaliartin coal.

The following table shows the analysis of the coal produced by the above mentioned companies:

Name of Company	Moisture	Ash.	Sulphur	Coke	Organic Subst.		Heating Value		
					Volat.	Non. Vol.	Theoret. (calories)	Available	
Tarbagatai mines	19.10	5.50	1.31	40.90	33.00	41.00	5530	5140	Does not slag, does not clinker.
Khaliartinsk	18.50	5.61	1.04	51.88	31.62	44.27	5165	4770	Small coal does not clinker.
Kharanorsk	27.40	3.40	0.32	38.90	38.50	35.00	4330	3890	Does not slag, does not clinker.
Kholbonsk	28.00	4.50	0.36	39.90	32.80	34.70	4000	3570	
Arbagarsk	13.75	3.46	0.54	48.01	38.29	44.55	5315	4915	
<i>Chernovsk :</i>	14.56	5.22	0.55	52.48	33.98	47.28	4760	4330	
Kalacheevsk									
Zamiatin	24.50	3.90	0.42	45.70	29.80	41.80	5031	4602	Does not clinker, does not slag, gives many sparks.
Sobeshchansky	18.00	3.61	0.60	48.47	32.61	44.90	5200	4795	
Sibirsky	19.10	10.01	0.39	50.46	30.40	40.45	4570	4150	
	11.50	9.40	0.42	54.17	34.46	44.67	4565	4120	

The Tarbagatai coal is the best in Transbaikal, and the Kharonosk the worst.

As regards the characteristics of each of the above mentioned coal deposits and their possibilities for the future, the following may be said:

The **TABAGATAI DEPOSITS**, situated near siding 37 of the Transbaikal railway, have been worked since the beginning of the nineties. This deposit forms a large basin situated in the valley of the river Khilka. In the direction the valley running from west to east, exploration work has been carried on for 2 versts (the greater axis of the basin). The depth of the coal

deposit in the extreme eastern part of the explored section is 315 feet, which indicates a continuation of the basin to the eastward, but its end has not been followed up; by previous exploitation and investigation the width of the basin has been found to reach 2 versts. In the explored part of the Tarbakatai coal deposit there is a layer of brown coal 35 feet deep; this coal is of the best quality in Transbaikal.

The reserve of coal in this part of the basin is three billion poods (1 pood—36.11 lbs.).

Since the opening of this mine about 120 millions of poods of coal have been produced; since 1914 the work was carried on on the right bank of the river Khilka through a surface cut over a distance of one verst and to a depth of about 84 feet.

Owing to the worn out condition of the steam boilers at the electric station which supplied the power for the big water pumps (200,000 buckets per hour) and the absence of spare boilers to run while the old ones might have been repaired, the cut could not be deepened, and it was flooded at the end of June, 1919.

Prior to the revolution, 12 to 15 million poods of coal were mined from this cut annually, but subsequently, owing to the difficulty of deepening, and the inadequate power of the steam boilers for pumping, production fell to 3-4 millions of poods annually.

After the flooding of the cut, the company began to work a new section, also on the right bank of the Khilka, by surface mining, but owing to the high cost of materials, insufficient preliminary work, low productivity of the workers, and the general political situation, it was not possible to develop intensive activity, and production fell to 150-200 thousand poods monthly.

Among the disadvantages of this deposit should be mentioned the considerable influx of water due to the location of the deposit in the valley of the river Khilka. For rapid pumping an electric power-house was installed, with two turbo-generators of 600 and 300 kilowatts per hour.

In the beginning mining was done underground and about 50 million poods of coal were produced in this way. But work was suspended in 1912 after a fire and has not been resumed.

It should be noted that the most rational method of working the Tarbagatai mines is underground, with wet timbering;

there are all conditions to favor this method: absence of frozen ground and predominance of sand in the Khilka river valley.

The market price for coal prior to the war was 12 kopeks per pood; in general, the price of Tarbagatai coal exceeded the price of Chernovsk coal by 10 to 15 per cent.

All the conditions favor the reopening of these mines. We shall here enumerate the following:

1. The excellent quality of Tarbagatai coal, justly considered the best in Transbaikalia.

2. The extent of the coal deposit, which can supply the local coal market for many decades.

3. The big demand for Tarbagatai coal by the Transbaikal railway, as well as by industrial concerns in Verkhneudinsk, where the conditions are particularly favorable for the development of all forms of industry, by reason of: a) two navigable rivers; b) railways; c) large timber lands; d) proximity of grain belt; e) direct transit route via Urga with Mongolia, the great supplier of cattle and wool, and a tremendous consuming market for all kinds of manufactured goods.

**KHALIARTINSK DEPOSIT**, situated 17 versts to the east of Tarbagatai contains a coal vein of an average depth of 15.4 feet. This layers lies almost horizontally above the valley of the river Tolbaga, over its right bank.

The absence of water, the high quality of the coal (next to Tarbagatai coal), and the favorable situation of the deposit, which crops out in the dip of the valley of the river Tolbaga, make it possible to work it by galleries in the outcrop of the seam, without building expensive shafts; for this reason this deposit should be considered particularly suitable for exploitation; its remoteness from the railway, however, necessitates the building of a railway branch of about 12 versts long to the station of Tolbaga, with a bridge across the river Khilka.

The cessation of work in the Tarbagata mines prompts the Government of the Far Eastern Republic to take urgent measures in order to start work on the Khaliartinsk mines as soon as possible and to build the railway branch-line and the bridge. These latter constructions have already been started, and some of the property of the Tarbagatai mines for the fitting out of the mines was made use of.

The Khaliartinsk deposit has not been explored very thor-

oughly. An investigation made in 1920 of a part of the deposit estimated the apparent amount of coal at 82 million poods; the investigations were continued in 1921 and there is reason to infer that the Khaliartinsk deposit is of great extent, as coal is found with but slight digging at a distance of 2 versts from the Khaliartinsk mines.

As soon as the railway spur is built, and with the facilities at hand, it will be possible at the present time to produce at the mine 500,000 poods of coal per month; in the near future the monthly output may be increased to one million poods.

The **CHERNOVSK DEPOSIT** is situated 18 versts to the west of Chita and 3 versts from the Chernovsk siding of the Transbaikalian railway, with which it is connected by a railway line.

The Chernovsk deposit is in the form of a basin slightly over four square versts in extent. The seam of coal is almost horizontal with a slight elevation, not over 5 degrees at the outcrops. The working seam is about 24½ to 28 feet thick, while the covering layers (of peat) are from 21 to 77 feet thick. Besides the working seam, there is another seam fourteen feet below, the latter not being worked at present.

The amount of coal in the upper seam alone is more than one and a half billion poods.

The quality of the Chernovsk coal is fourth, after the Tarbagatai, Khaliartinsk and Arbagarsk mines; in the open air the coal crumbles when exposed to the direct rays of the sun. Stacked up in a dump it remains in good condition for a long time. The coal is not at all self-inflammable.

The particular favorable features of the Chernovsk deposit are the following:

1. The even lay of the seam, almost horizontal, along the entire distance.
2. Entire absence of ground water.
3. Easy penetration of the covering layers (sandy clay) by means of spades and mechanical devices (excavators).
4. Easy production of the frozen coal by means of dynamite, so that during an eight-hour shift one hard rock miner can handle 400 poods of coal.

The unfavorable features of this deposit is the permanent freezing of the layers covering the coal seam, which necessitates thawing of the ground before work can be commenced. There-

fore, the work here is only seasonal, and during the summer; also, in view of the slow process of thawing a large working front has to be made for the production both by means of muscular power (worker and horse) and with the aid of mechanical appliances (excavators).

The coal is produced by surface work.

The production of coal on the Chernovsk mines is the highest in all Transbaikalia, reaching 20,000,000 poods annually; with the introduction of certain improvements in mining equipment, particularly in uncovering the overlying layers and by providing living quarters for the workers, the production could be doubled in the near future.

One earth-remover, with one horse and a driver, can remove in the summer 4,116 cubic feet, and in the winter 205.8 cubic feet.

The two excavators with multiple scoops now working on the mines can cover—one, 85,750 cubic feet, and the other 41,160 cubic feet per working day.

The productive working day of an excavator is not more than 10 hours, as the thawing of the ground is a slow process, not exceeding 0.7 feet per day. The present surface available for the work of the excavator, about one verst, is insufficient for productive work and should be extended; this can easily be accomplished. The excavators work in two layers—the smaller with a 21 foot depth of scoop, the larger with a 28 foot depth; the thickness of the layers in which the excavators are working at present is 56-63 feet; the cleaning up of the remaining earth is done by hand, by earth-removers. In parts of the mines the opening up is done only by hand labor.

The coal produced is transported through the cut to elevators in small iron trucks on rails and is then loaded by means of an escalator direct into railway cars.

In this way, the successful production and transportation of the coal depends to a great extent on the proper supply of cars by the railway for the loading of the coal.

Up to 1919 the working companies succeeded by the end of summer in extracting the whole amount of coal that had been calculated as the annual output, viz: about 20 million poods; in the last two years, however, owing to the general political situation and financial and economic difficulties it was

very hard to obtain earth-removers, who are really small contractors, and not mine workers. For this reason during the last two years the ground was opened up also during winter by means of so-called "fires", to thaw up the ground, some of the coal produced being used for this purpose. Firing of 7 inches thick thaws up ground to a depth of 42 inches.

Owing to the scanty preparatory work that was done in the summer period of 1919, and particularly in 1920, the supply of opened-up coal became considerably smaller and by the end of 1920 it was only 5 million poods instead of the usual 20 million.

Up to 1919, the Siberian Company which was working a part of the Chernovsk mines exploited a coal seam 8.4 feet thick, by underground working (the Kalacheevsk mine); this seam lies in an elevation, about one verst from the Chernovsk siding. Owing to a considerable flow of water and the high cost of production, as compared with the open workings on the Chernovsk deposit, this seam was abandoned and is at present flooded.

The **ARBAGARSK DEPOSIT** is situated 7 versts from the Kholbon siding of the Sretensk branch of the Transbaikal railway and 18 versts from the city of Nerchinsk. This deposit has two working seams, 8.4 and 4.2 feet thick, basin shaped with a drop of the layer 10-15 degrees in the section of the mould now being worked.

The quality of this coal is higher than that of the Chernovsk, but inferior to the Khaliartinsk.

At the Kholbon siding there is another coal deposit, which is undoubtedly a continuation of the Arbagarsk. Work was done here up to 1911, but the proximity of the Shilka and the big flow of water forced the abandonment of work here and a concentration on the Arbagarsk deposit.

The coal is brought up through a vertical shaft 126 feet deep and a horizontal driftway 2450 feet long.

The amount of coal explored is 200 million poods; 3 million poods are ready for production at the present time.

The monthly production is about 250,000 poods.

More intensive production is prevented by the inconvenience of having to deliver the coal to the Kholbon siding by horse power on a narrow gauge line. Shortage of feed for



the horses, and the difficulty of winter transportation in general, which is discontinued during snowstorms, and in summer during the rains, make it impossible to deliver to Kholbon all the coal produced; delivery by horse power is therefore beginning to be replaced by steam power, and in the beginning of spring of this year the construction of a wide-gauge railway line will be commenced, with a view to increasing production and transportation of coal without reloading.

With the present facilities of the Arbagarsk mines, after the wide-gauge line is laid, it will be possible immediately to increase production to 400-500 thousand poods per month.

The **KHARANORSK DEPOSIT** is situated two miles to the west of siding 79 of the Transbaikal railway. It contains a coal seam 56 feet thick, extending over an area of 2 square versts. The reserve of coal is over one billion poods.

The coal is not of high quality and will not stand exposure to the open air, but can be briqueted. This latter property must not be overlooked in view of that fact that in the faces of the drift there remains about 20% of unutilized small coal, and if the Kharanorsk coal is briqueted, its main defect—crumbling in the open air—will be done away with.

The seam lies horizontally, somewhat undulating; the thickness of overlaying strata is 28 to 84 feet. Hitherto work has been done underground, but more recently the first steps were taken to work the deposit in the open.

Work is done through two shafts; about 400,000 poods is produced per month.

If open work is introduced, the mines will produce within a year not less than a million poods of coal per month.

Next to the seam now being worked, nearer to siding 79, there is another seam, 35 feet thick, not deeply imbedded. This seam is interspersed with numerous deposits of coal in frozen ground, which makes this coal unsuitable for heating boilers; in time, when the Kharanorsk coal is briquetted, there is no doubt that also this part of the deposit, extending over an area of over four square versts, with billions of tons of coal, will become industrially valuable. At the present time it has no industrial value.

**SUMMARY OF ANNUAL PRODUCTION OF COAL, THE  
NUMBER OF WORKERS AND AMOUNT OF COAL READY  
FOR SALE IN TRANSBAIKAL MINES**

Name of Mine	Year	Production in poods	Average number of workers	Supplies on hand at end of years (in poods)
<i>Chernovsk Mines:</i>				
Zamiatin Bros.	1916	11,006,068	338	30,000,000
	1917	12,641,423	360	26,000,000
	1918	8,496,560	474	.....
	1919	9,041,612	656	.....
	1920	5,480,000	575	.....
Sobeschansky	1916	2,910,873	.....	.....
	1917	6,113,575	.....	.....
	1918	4,181,916	239	20,000,000
	1919	6,127,522	325	21,000,000
	1920	5,230,000	375	5,500,000
Sibirsky	1916	4,671,535	346	.....
	1917	5,380,785	440	.....
	1918	3,190,135	375	.....
	1919	4,914,823	372	.....
	1920	4,100,000	380	.....
Arbagarsk Mines	1916	2,015,627	200	.....
	1917	2,557,490	390	.....
	1918	1,574,165	442	7,500,000
	1919	2,741,222	386	5,000,000
	1920	2,580,000	234	3,000,000
Kharanorsk Mines	1916	2,713,792	160	.....
	1917	3,197,935	225	.....
	1918	1,121,776	.....	4,000,000
	1919	1,774,037	170	3,000,000
	1920	2,804,825	223	1,000,000

Remark: 1 pood—36.11 lbs.

Name of Mine	Delivered to Transbaikal Railway		Delivered to private consumers	
	1917	1918	1917	1918
Chernovsk	18,490,000	13,510,000	4,387,000	2,124,000
Arbagarsk	1,925,000	2,298,000	94,000	87,000
Kharanorsk	1,926,000	2,378,000	447,000	91,000
Tarbagatai	7,500,000	3,200,000	1,400,000	400,000
Total	29,841,000	21,386,000	6,328,000	2,702,000

The year 1917 witnessed the most intensive production of coal in Transbaikalia. The Transbaikal railway received during that year from Transbaikal mines 30 million poods of coal. Another 5 million poods needed by the railway were supplied by the Cheremkhovsk mines (beyond Irkutsk).

Beginning with 1918 the increased deterioration of railway transport and the general disorganization caused the production

of coal to fall continuously and with it the supply of the Transbaikal railway.

The following figures show the production for the last five years in the mines now working:

1916—	18,588,476	poods.
1917—	24,135,083	“
1918—	17,800,270	“
1919—	20,083,957	“
1920—	14,810,000	“

To these figures should be added the production of the Tarbagatai mines, now closed, as follows:

1916—	14,000,000	poods.
1917—	12,000,000	“
1918—	4,000,000	“
1919—	2,000,000	“
1920—	1,000,000	“

## II.

### MINERAL COAL DEPOSITS IN THE AMUR PROVINCE

The coal mined in the Amur province, just as in Transbaikalia, is almost exclusively of the brown soft coal variety. There are few hard coal deposits known, and these are not very big.

#### A. Brown Coal Deposits

##### I. Bureinsk-Zavitinsk District.

This brown coal district is the most important in the entire Amur Province. The coal-bearing area is about 200 square versts. The average thickness of the coal seams is 10.5 feet. According to the geologist Maliavkin, who explored this district, the reserve of working coal here is about 28,000 million poods. The coal may be classed among the pitch coal. Some varieties, as for instance, the Varvaro-Valinsk, even give a faintly clinking coke. The coal is solid and keeps fairly well. Its heating value is 5,750 cal. It is evident that this coal belongs to the better varieties of its class. Among the advantages of this district are: the horizontal position of the seams and their outcrops on the surface, which make it possible to work the coal in galleries.

There is now working in this district the Kivdinsk deposit,

situated within 4 versts of the Bureya station, on the Amur railway. The present production of these mines is 300,000 poods per month. Preparatory work is now being done on the Arkharo-Boguchansk deposit, situated next to the railway.

## 2. Khabarovsk Brown Coal Deposits.

There are a number of brown coal deposits in the Khabarovsk district; the most important is the deposit of brown coal (lignite) near the Amur naval "base". The estimated extent of these seams, according to the geologist Anert, who investigated this deposit, is from  $1\frac{1}{2}$  to 2 versts in length and about 1 verst in width. The quality of the coal is not particularly good, but is suitable for heating houses and stationary boilers.

Extensive brown coal deposits are also known to exist in many other places in the Amur Province, for instance, along the river Zeya, from the village M. Sazanka to the Arbashka fall; also in other places; but little exploration work has been done for all these deposits.

## B. Hard Coal Deposits.

The only hard coal deposits exploited in the Amur coal region are:

### 1. The Birsk Deposit.

This deposit is situated near the station of Bira, on the Amur railway. The coal mined belongs to the dry coal varieties (non-cooking); the coal is of fairly good quality for fuel purposes, but the deposit is only a small island with a limited reserve of coal (about 10,000,000 poods). The present production of the mines is only about 60,000 poods per month.

### 2. The Pokrovsk Deposit.

This deposit is situated in the basin of the river Deppa, 45 versts above its mouth, on the right bank. This coal can be coked. As the district has been but little explored, the reserves of coal are not known.

The defect of this deposit is its remoteness from the railway.

Other hard coal deposits are known to exist in various other places in the Amur province, but no investigation has been made and no details are known.

### III.

#### THE COAL INDUSTRY IN THE MARITIME PROVINCE

Deposits of hard and brown coal are found principally in the South-Ussurisk territory, near Vladivostok and Nikolsk-Ussurisk.

With the exception of the well equipped Government Suchansk mines and of two private concerns mining brown coal, Skidelsky and Arzt, all the other enterprises are small, having merely household proportions.

The following table gives the names, the situation and production of the mines in this district:

<i>Name of Concern</i>	<i>Where Situated</i>	<i>Production in 1919</i>
<b>Private Concerns:</b>		
<b>A. Hard Coal</b>		
1.. Podgorodnie—S. V. Lindholm & Co.	25th verst on Ussurisk railway from Vladivostok.....	1,872,631 poods
2.. Danilovsk—Heirs of D. S. Borodin—Lessees: Engineer Trojanovsky & Co.	4 versts west of Nikolsk-Ussurisk .....	518,737 “
3.. Nadezhdinsk—Kotliarov, Vystrop & Berendeyev.	8 versts N.W. of Nikolsk-Ussurisk .....	1,071,341 “
4.. Lipovetzsk—Lipovetzsk Coal Co.	Near Lipovetzsk siding, 40 versts west of Nikolsk Ussurisk .....	895,268 “
5.. Mongugaisk—U. I. Briner.	Along river Mongugai, 15 versts from Amur Bay.....	615,177 “
	Total amount of hard coal produced in 1919.....	4,971,202 poods
<b>B. Brown Coal.</b>		
1.. Zybun—Heirs of L. S. Skidelsky.	9 versts from station Ugolnaya along Suchansk branch	9,644,111 poods
2.. Ugllovsk—Lessee: Arzt.	2 versts from st. Ugolnaya	4,114,420 “
3.. Alexeyevsk—Lessees: Kramorov & Skorulsky.	4 versts from st. Ugolnaya	1,109,595 “
4.. Krayeugolno—Spasovsk—Heirs of Startsev.	Station Ugolnaya .....	1,270,000 “
5.. Nikolaevsk — Nikolaevsk Coal Co.	Near Amur Bay .....	851,571 “
6.. Novaya Nadejda—Lessee Tkhorevsky.	Near the mouth of the river Suifun .....	372,686 “
	Total amount of brown coal produced in 1919.....	17,163,383 “

We shall now take up the above mentioned coal mines in order, giving the following important facts on each.

1. **Podgorodnie** mines work a seam of hard coal 6.3 feet thick, with dip of 20-30 degrees. The main defect of the coal

is its high contents of ash, being about 30-40%, by hand picking this amount of ash is reduced to 25%; should the method of washing the coal be employed, in which direction no attempt has been made by the company, the percentage of ash would be greatly reduced, and the coal find a market on sea-going steamers. The price for large coal prior to the Revolution was 15 kopeks for small coal and 8-11 kopeks per pood.

The reserves of coal have not been ascertained, but are not less than 100 million poods.

2. Danilovsk mine, belonging to Borodin Estate, working a seam 5.6 feet thick, with a dip of 30 degrees; above it is hard sandstone. Work is done on a petty scale. The big flow of water and absence of water pumping apparatus prevents the development of production.

An investigation estimates the reserves here at 150 million poods.

The price of coal in peace time was from 5 to 11 kopeks per pood.

3. The Nadezhdinsk mine is working a seam 4.9 feet thick with an angle dip of 15 degrees. The character of the working is the same as on the Danilovsk mine. The limited means at the disposal of the operators prevent them from developing production.

4. Lipovets coal mines are working a seam 7 feet thick; the coal is ashy, and there is only one small apparatus for washing it.

5. Mongugaisk mines—Briner's, consist of six working seams, 4.2 to 7 feet thick. The coal gives little smoke, does not clinker, and burns with a low flame. The deposit is much littered with landslides, which complicates prospecting. The reserves of the coal here have not been ascertained.

Of the above enumerated brown coal mines—the Zybunnye, Uglovsk, Alexeyevsk and Krayeugolno-Spassovsk mines are situated in the deposit of one basin, extending over a large area of 39,200,000 square feet, the average thickness of the seam being 8.4 feet. This deposit contains a reserve of coal of not less than 500 million poods.

The pre-war price of brown coal was 6 to 9 kopeks per pood.

Further extension of the brown coal deposits was recently discovered in the same basin along the Suchansk railway and

a new enterprise is now being formed 13 versts from the station of Ugolnaya.

The brown coal deposit, on which is situated the Novaya Nadezhda mine, extends a considerable distance over the territory of the Tavrichanka village beyond the Amur Bay, opposite the station of Okeanskaya, and contains 6 seams of excellent pitchy brown coal. At the present time only two of these are being worked, 7 to 4.9 feet thick. The deposit has been investigated over a distance of more than 4 square versts and contains more than a billion poods of coal.

Besides the above enumerated deposits, on which work is being done, there is a number of brown coal deposits extending over many versts along the Ussurisk bay. These deposits are considerably richer in coal than the deposits along the Amur bay, as described above, but the comparative remoteness of these deposits from the Ussurisk railway prevents installation of work there.

In general, it may be stated that the South-Ussurisk territory contains colossal reserves of brown coal—estimated at several billion poods; the shallow depth of the seams and the low cost of production enable the brown coal to compete successfully with the Japanese and Suchan coal, wherever it is possible to use brown coal, and it is in a position to satisfy the local market under any circumstances.

The principal consumer of brown coal is the Ussurisk railway and the industrial enterprises in Vladivostok.

The Suchan Government mines stand first among the hard coal mines, in the amount of its reserves of coal, in its quality, as well as in the equipment of the mines. It may be said that the Suchan mines were and still are the chief regulators of prices on the Vladivostok coal market, moderating the appetites not only of the local operators, but also of the Japanese, who supply coal to the steamers of our Volunteer Fleet and import considerable quantities of coal to Vladivostok.

In the last few years systematic and extensive exploration work has been carried on on the Suchan deposit with the result that the apparent reserves are estimated at 800 million poods, and the possible—at 2 billion poods.

The Suchan mines have three working seams, each averaging 4.62 feet; the seams have been explored to a depth of

1,050 feet, and over a distance of 5 versts; the average dip of the seams is 45 degrees. The quality of the coal in one seam varies from the typical clinking coal, with volatile ingredients up to 20%, to semi-anthracite coal; the change is accounted for by the effect of effusive strata crossing the deposit.

The mines are worked by means of six inclined shafts laid in the outcrops of the seams.

About 12 million poods of coal, i.e., the amount of the annual output, have been cut and lie in the fields.

During the period of civil war when work on the mines was reduced and subsequently temporarily discontinued, the mine timbering deteriorated and a considerable outlay is now required to support the haulage ways, extending for 1.5 versts, and also to support the sections of coal already cut, but not yet taken away.

The coal is high quality: 65-70% coke.

Production of coal here is as follows:

Year	Clinking Coal		Semi-Anthracite		Total	
	Output	Sold	Output	Sold	Output	Sold
1916	13,832,860	10,940,552	2,678,424	1,600,251	16,502,284	12,540,000
1917	15,742,410	12,082,462	2,215,000	971,691	17,957,410	13,054,153
1918	10,707,016	8,041,223	1,884,870	1,292,335	12,591,886	9,333,558
1919	8,413,080	3,232,698	1,026,392	315,646	7,439,472	3,548,344

At the present time production has again increased to 1,300,000 poods per month, and has thus reached the pre-war figure, but owing to shortage of cars on the narrow gauge railway and to the general disintegration of railway transport, the export from the mine is only about 600-800 thousand poods per month.

Fifteen million poods may be considered the maximum total output, which may not be exceeded under present conditions of transport.

To increase export, and consequently the corresponding production of coal, it is necessary to construct a wide-gauge railway line, which, with detours would be not less than 45 versts in length. The survey work for this construction has already been completed, but the general financial situation prevents the carrying out of the construction.

In the event of a wide gauge line being laid to the Suchan



mines, these with their present facilities would in the shortest period be able to double their output, raising it to 25 million poods a year, and completely covering the demand for specially high quality coal on the Vladivostok market (for seagoing steamers).

In addition to producing coal, the Suchan mines also produce coke, being the only enterprise in the Far Eastern Republic to engage in the production of coke.

The following figures show the production of coke for 1916-1919:

1916—	265,537 poods.
1917—	340,078 “
1918—	184,442 “
1919—	79,294 “

The following table gives the export figure of coal mined in the Ussurisk territory on private and government coal mines (in poods):

Year	Brown Coal	Hard Coal	Total	Coke	Total
1916	12,241,444	17,126,195	29,367,639	265,537	29,633,176
1917	12,283,955	18,135,783	30,419,738	340,078	30,759,816
1918	14,417,843	13,194,000	27,611,843	184,442	27,796,285
1919	15,252,572	8,171,910	23,424,482	79,294	23,503,776

The above amounts did not cover the entire needs for coal in the Ussurisk territory, so that foreign coal, chiefly from Japan, always was and still is being imported. The following are the import figures:

Year	From Japan	From England	From America	Total foreign importation
1916	2,928,467	.....	.....	2,928,467
1917	1,466,066	104,132	6,355	1,570,553
1918	486,550	.....	.....	486,550
1919	2,428,657	.....	.....	2,428,657

In 1919 also the Interallied Railway Commission imported from Japan 2,400,000 poods of coal for the Ussurisk railway.

The import of coal from Japan was highest in 1915, when it reached 5,089,727 poods. The subsequent drop in this import is due, on the one hand, to the fall of the ruble, on the other—to the shortage of freighters on account of the world war. Again the sharp rise in the import figures for 1919 is

accounted for by the suspension of work on the Suchan mines and the impossibility of replacing Suchan coal with other local varieties where particularly high quality coal is required (as e.g., for steamers).

Thus the figures for the last few years show that the Ussurisk province is able to take care of its own needs for coal, without foreign importation, if steps be taken for providing the necessary workmen, as well as the necessary materials for equipment, and food supplies.

Under such conditions production can within the next few months be doubled.

#### IV.

### COAL MINING INDUSTRY ON RUSSIAN SAGHALIN

Vast deposits of hard and brown coal are known to exist on the entire western coast of the island, from the most northern extremity up to the Japanese frontier, covering a distance of 450 versts.

Coal deposits were also discovered by many explorers in the central part of the island, along the rivers Tymi and Poronai, and also on the eastern coast.

Outcrops of brown coal are found only in the northern part of the island and partly in the center; among them may be mentioned:

1. In northern Saghalin, on the river Pilvo.
2. Between the Giliatsk nomad camps at Viskovo and Tamlovo.
3. To the south of Tomlovo.
4. South of Trambaus village.
5. In the southern part of the Uandi bay.
6. Near the river Pyor-Urly.
7. To the north of river Hoi to the river Rukina, over a distance of 6 versts.

In the central part of the island:

8. Along the river Tymi, between the villages Voskresenski and Uskovo.
9. On the left bank of the river Poronoia, opposite Kazarsk village.

Regular hard coal is known:

1. In the northermost extremity between capes Maria and Elizabeth, in the Kuegda` bay.
  2. Along the middle course of river Hoi.
  3. In the river bank deposits between Hoi and Malaya Tanga.
  4. In the left source of the river Tanga.
  5. On the sea coast south of the mouth of river Tanga, at the northern end of Cape Tanga.
  6. From Mgach village to Maly Surtunai—a large suite, being the western wing of the Vladimir-Mgachinsk anticlinal.
  7. Along the river Maly Surtunai.
  8. Along the river Niami.
  9. The same suite is found open in the source of the river Arkovo, near Kamyshevsk pass.
  10. Near Alexandrov Post and in the bared coastline of Cape Jomkier.
  11. Near the lighthouse at Alexandrov Post.
  12. From Lapshin Falls to Cape Hoindje, on the bared coastline and at Voyevoda, Ugolny, Duisky and Kirpichny Falls (Duisk suite).
  13. South of Cape Rogaty, along the rivers Pereselencheskaia, Chornaya and Doktorskaia.
  14. South of Cape Hoindje, near Ogorodny Falls.
  15. Between Capes Spasenny and Kamenny.
  16. Along the river Nai-Nai.
  17. In the bared coastline at Pilevo.
- At the foothills of Western Saghalin Mountain Range:
18. At the source of Malaya Alexandrovka.
  19. At the fall of Bannaya (Tymovka) near Mikhailovsky village.
  20. At the right branching of the river B. Alexandrovska above Bannaya up to village Krasny Yar and further south.
  21. Along Vladimirsk spring, near village Vladimirovka.
  22. In the upper course of river Agnevo.
  23. Along river Pilevo, 2 and 4 versts from its mouth.
  24. In the right tributaries of Paronaia.
  25. On the right bank of river Tymy, near its fall into river Nys.
  26. On the right of river Tymy, near the fall of river Vel-Vel and 2 versts below.

27. In the middle course of river Nabil.
28. In three outcroppings on the river Daga.
29. Along river Evai.
30. Along river Val.
31. At the 37th verst from the Japanese frontier, along the river Hoi.

The conditons of the coal deposits here vary greatly: in the coal bearing parts of the Western and Eastern ranges and in their foothills the plicate formation predominates, with slight precipitation. In the coast range, south of Cape Jonkier up to the Japanese frontier, the seams are broken up by effiusive layers into separate sections; numerous precipitations in various directions and of various sides complicate the picture of the coal-fields.

**Amount of Coal.** On the basis of previous works, an estimate was made in 1905 of the coal deposits in the coast line between Mgach and Due, over a distance of 30 versts, and to a depth of 700 feet; a calculation gave the figure of 2 billion poods of hard coal. In the following 10 years information about the coal deposits in the coast line was considerably increased: estimates made by Engineer Tulchinsky in 1906 place the amount of coal in Alexandrovsk deposit at 234 millions, in Mga-chinsk at 530 millions and in Vladimirsk at 1,500 millions. It was further ascertained that the Alexandrovsk suits of coal, with the five definitely known working seams of an average thickness of 18.2 feet, bending in synclinal directon, appear again in the foothills of the Main Western Mountain range, in the right tributaries of the rivers Malaya and Bolshaya Alexandrovka and beyond—up to the valley of the river Arkovo, that is, over a distance of more than 15 versts. The reserves of mineral fuel in this large area must exceed at least ten times the reserves of the Alexandrovsk mine, which are estimated at about 200 million poods. On the basis of old works conducted on the Voyevoda, Ugolny and Duisk gorges, and on the basis of the natural outcroppings in the coast line in 6 working seams near Cape Hoindji, of an average thickness of 14 feet, estimates were made of the coal reseves in the Duisk suite over a distance of 4 square versts, 700 feet deep, and resulted in a figure of about 2 billion poods of coal.

The Vladimirsk-Mgachinsk siute from river Arkovo to Cape

Tanga, a distance of about 20 versts, in the shape of a coast anticlinal, contains about 8 working seams, with an average thickness of 33.25 feet; the total reserve of fuel here reaches 8 billion poods. Exploration work near Cape Rogaty along the rivers Pereselencheskaia, Chornaia and Doktorskaia brought to light a new and extremely rich deposit of no less than 3 working seams. Therefore, the amount of coal in Sakhalin may be considered enormous.

**Quality of the Coal.** The following two groups are predominant among the Sakhalin coal: dry long-flaming coal (first Gruner group) and oily, clinking coal (second Gruner group). To the first group belong the Mgachinsk, Vladimirovsk and Tyma coal, to the second—duisk, Pilevsk and Nai-Nai. The Alexandrovsk coal and that from Cape Rogaty may be classed an intermediary of the two. Among the valuable qualities of the Sakhalin coal are: almost entire absence of sulphur, almost no admixture of slate, small percentage of ash, while the coal of the second group has the additional advantage of producing over 70% of high grade coke, has a high heating value (over 800 calories) and gives concentrated heat.

**Review of Existing Enterprises.** In spite of the wide extent and the high quality of its coal, the Sakhalin industry is still in its infancy.

The principal obstacles for the development of the Sakhalin coal mining industry are: the absence of a protective port and shortage of boats for the transport of the coal.

The following companies were working in Sakhalin in 1919: 1) I. Stakheev & Co., 2) Kunst & Albers, 3) Lilge & Co., 4) Briner & Co., and 5) Alexandrovsk Labor Artel (cooperative). These enterprises all gathered near Alexandrovsk port, with the exception of the Briner Company, which was working near the Japanese frontier, on the Pelivsk deposit, and Kunst & Albers, which worked the Mgachinsk deposit, 20 versts to the north of Alexandrovsk Post.

The export of Sakhalin coal to Vladivostok never exceeded two and a half million poods per annum.

In the last few years the export was as follows:

1916—	184,000	poods.
1917—	327,428	“
1918—	65,860	“
1919—	1,130,000	“

The increase of production in 1919 is accounted for by the suspension of work on the Suchan mines and the necessity of substituting it by coal of corresponding high quality; shortage of boats for the export of the coal prevented the export figure from being higher.

The absence of a port results not only in the small amount of coal exported, but also in the high cost of freight, in view of the fact that it is very rare for a boat to be loaded up at once, as sometimes it must lie for weeks in the open sea or in the protection of De Kastri bay (120 versts from Alexandrovsk Post inland) waiting for favorable weather.

Difficulty of loading increases freight charges and is one of the principal items of expense on coal. The following table shows the pre-war cost per ton of coal from Duisk mines:

Labor to prepare and produce one ton of coal....	1	ruble—	18.3%
Rolling it to warehouse on coast.....	.20	kop. —	3.7%
Loading on steamer.....	.60	“ —	11 %
Freight to Vladivostok.....	2	rubles—	36 %
Government tax .....	.45	“ —	8.3%
Unloading from boat in Vladivostok.....	.50	“ —	9.2%
Mine management expenses.....	.15	“ —	2.8%
Timber .....	.25	“ —	4.6%
Lifting and Lubricating.....	.10	“ —	1.8%
Pumping .....	.10	“ —	1.8%
Office expenses .....	.10	“ —	1.8%
Total .....	5	rs. 45 kop.—	100%

Thus, the cost of freight to Vladivostok is the most expensive item, being twice as high as the cost of production from the ground, and, together with the cost of loading and unloading ing, represents 57% of all overhead expense.

It should be added that the topographical conditions of the coast strata of the western coast line are such that it is possible, without any expenditure for preliminary work, to commence mining coal direct from outcrops by galleries, making use of the deep sharp inclines and gorges which cut up the coal seams in numerous places; at Cape Rogaty, for instance, over a distance of about a verst, a deep crevice cuts across 4 working seams, each 7 feet deep, laying driftways in the

seams at the bottom of the gorge gives at once eight working fields about 700 feet high each. In conclusion, it is necessary to point out that the position of Sakhalin and its tremendous coal resources promises an important future to Russian Sakhalin. The building of a port is the primary cornerstone of this future.

## APPENDIX I.

### SOFT COAL DEPOSITS OF THE ZABAIKAL PROVINCE

1. The Tarbagataysky soft coal deposits lie in the valley of the river Khilka, at the mouth of the river Tigna, which is its right tributary, near the 37th siding of the Transbaikal Railroad. These deposits have been mined for the last 15 years; now mining has been stopped; there remained a supply of soft coal of about 40,000,000 poods, but a vast area of this deposit has not yet been investigated much, though the deposits are estimated at about one billion poods.

2. The Khalertinsky soft coal deposits lie along the river Talbaga, the left tributary of the Khilka River, flowing into it about 7 versts above the mouth of the stream Tigna. The above deposit is situated on the right slope of the valley of the stream, 10-12 versts above its mouth and at about the same distance from the Talbaga Station of the Transbaikal Railroad. Thus far about 55,000,000 poods of soft coal deposits have been estimated. Mining continues at present.

3. Along the stream Shibirga,  $1\frac{1}{2}$  versts from its entrance into the river Khilok, near the Katayevsky village.

4. On the right slope of the river Balyaga, 5 versts from its mouth.

5. Along both slopes of the valley of the river Balyaga, 718 versts above the Petrovsky Works.

6. Near the village Kulya and above the village Tarbagatay.

7. Near Gutay-Nor, not far from the Bichursky village, on the left side of the valley of the river Khilka.

8. Along the stream Sukhara, the left tributary of the river Tugnuy.



9. At the source of the stream Saranta, flowing, from the left, into the Khudun River (left tributary of the Uda River), opposite the Chikansky Datsun Mountains, is found laminiform coal or laminiform combustible schist.

10. At a distance of 20 versts from the city of Verkhneudinsk, along the Chita road, along the Dabatuy stream, flowing from the mouth of the Ivanovka.

11. Along the stream Ivanovka, the left inlet of the Chikoy River, and also along the bank of the latter, not far from the mouth of the Ivanovka.

Near the Kochen village (Archangel village).

13. One verst above the village Krasny Yar, along both sides of the Chikoy River.

14. In the cliffs of the left bank of the Chikoy River, between the streams Marfina and Afonkina, flowing into the Chikoy River above the village Shumberlik, and also along the valley of the Marfina stream.

15. Near the village Beregovaya, in the valley of the Chikoy River.

16. Near the station Zhibkhegen, opposite the Badinsky Steppe, between the railroad stations Bada and Khilok.

### The Valley of the Ingoda River.

17. Near the village Staro-Kliuchevsky, at the sources of the stream Ustinikha, flowing, from the right, into the Smarnyaga River, the right tributary of the Ingoda River.

18. Along the stream Gareka, near the village Gareka.

19. Along the stream Ulyatuy, the left tributary of the Ingoda River, fragments of coal were found in small hillocks.

20. Outcrops on the left bank of the River Ingoda, below the village Novaya Kuka, in the Krutoy Yar.

21. Near the village Domninsky.

22. Near the Station Chernovsky, of the Transbaikalian Railroad, 18 versts southwest of Chita and 3 versts north of

the station. Coal mining is going on at present. The coal deposits of the entire coal mining area are estimated at 1,200,000,000 poods.

23. Near the village Kharamangut, on the right side of the valley of the Ingoda River, 3-4 versts from the siding Darasun of the Transbaikal Railroad.

24. Near the village Tyrgetuyevsky, lying at a lake, from which flows the stream Tyrgetuyevka, which enters, from the left, the Tura River, the right tributary of the Ingoda River.

25. Near the village Balzino, at the source of the Tura River, in several places, in small hills, occur pieces of coal.

26. In the valley of the Alenguyar River, the right tributary of the Ingoda River at the mouth of the Nygaylgun stream, in small hills occurs brown coal.

27. Near the village Undurginsky, lying between the stations of Karymsky and Bayandarginsky, 5 versts from the Ingoda River, along the left bank of the Dzhipkosen stream, are found three outcrops of coal seams.

#### Valley of the Onon River.

28. In the valley of the Onon-Borza River, 2 versts from the 79th siding of the Transbaikal Railroad, and 18 versts west of the Borza Station, in the locality of Kharanor, there are huge deposits of coal which are now being mined, estimated at about 1,750,000,000 poods.

29. On the right shore of the Urey River, the left tributary of the Aksha River, which flows, from the left, into the Onon River, small deposits of coal are found at a distance of 50 versts from the city of Aksha.

30. Along the Turga River, flowing, from the right, into the Onon River, near the Turginsky Village.

31. In the Shilka Basin, is found the Petrov coal deposit, lying near Lake Kholbon which is 5 versts east of the Mirsanovsky village, and altogether about 630 feet from the Shilka River. This source has been mined, but is abandoned at present.

32. The Arbagarsky coal deposit lies 7 versts north of the Kholbon Lake and 18 versts southwest of the city of Nerchinsk. Mining is going on at present. The coal reserve is estimated at 200,000,000 poods.

33. Near the Mironov Village, along the Kurenga stream, the right tributary of the Shilka River.

34. Along the Bukachach River, the right small tributary of the River Agita, which is the left tributary of the Kuenga River, are found coal seams of about 14 feet in thickness. The reserve is estimated at about 200,000,000 poods. This deposit has not been investigated much.

35. In the valley of the stream Kurlycha, the left tributary of the Shilka River, there are coal outcrops near the mouth of the stream, as well as at about 5 versts from the mouth.

36. Along the Zolotoy Log, on the left side of the Shilka River, 45 kilometers from the city of Nerchinsk.

Near the village Kukuysk, along the right bank of the Shilka River.

#### Along the River Argunya.

37. Above and below the village Gorbunova, near the Chalbuchinsky sentry, at a distance of 12-15 versts to the southeast of the Nerchinsk Works.

38. Between the Duroyevsky and Kaylastuyevsky sentries, along the Arguny River, is found a coal area extending 19 versts to the south of the Khilkovsky lot.

#### The Valley of the Vitim River.

39. Along the left bank of the Vitim River, 5-6 versts above its right tributary, the Nurokit stream—among various conglomerates and layers of slate-clay, there is a seam of lignite.

40. A seam of brown coal, of about 28 inches in thickness, is found 6-7 versts below the mouth of the Dzhilinda River, the left tributary of the Vitim River, among layers of slate.

41. Along the stream Zaza, the right tributary of the Vitim River, not far from the mouth of the Kisekh River, in the layers of slate marl, are found thin seams of lamiform brown coal.

## APPENDIX II.

### SUMMARIES OF MINERAL COAL

#### TRANSBAIKALIA:

Resources in the deposits being worked:		
1. Tarbagatai deposit .....	3,000,000,000	poods
2. Khaliartinsk deposit .....	62,000,000	“
3. Chernovsk deposit .....	1,500,000,000	“
4. Arbagarsk deposit .....	200,000,000	“
5. Kharanorsk deposit .....	1,000,000,000	“
Total .....	5,762,000,000	poods

#### AMUR PROVINCE:

Bureisk-Zavatinsk region .....	28,000,000,000	poods
Birsk deposit .....	10,000,000	“
Khabarovsk deposit .....	12,000,000	“
Total .....	28,022,000,000	poods

#### MARITIME PROVINCE:

1. Podgorodny deposit .....	100,000,000	poods
2. Danilovsk deposit .....	150,000,000	“
3. Nadejdinsk and Lipovetz deposit.....	200,000,000	“
4. Uglovsk .....	500,000,000	“
5. Tavrichesk .....	1,000,000,000	“
6. Suchan .....	2,000,000,000	“
Total .....	3,950,000,000	poods

#### PRODUCTION OF COAL

	<i>Before the war</i>	<i>At present</i>
In Transbaikalia .....	32,000,000	16,000,000
In Amur .....	No Production	4,000,000
In Maritime province.....	33,000,000	26,000,000
.....	65,000,000	46,000,000

#### DEMAND FOR COAL

	<i>For railways</i>	<i>Other consumers</i>
In Transbaikalia .....	35,000,000	6,000,000
In Amur province .....	20,000,000	8,000,000
In Maritime province .....	15,000,000	18,000,000
Total demand .....	over 100,000,000 poods	



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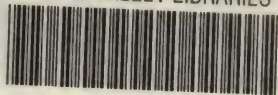
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