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Tittel

Meraker estate
Meraker mining-field.

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Rynning, R. Børresen, A. Lund, C. O.	Nov. 1901	Meraker Brug & Carbidfabrik A/S

Kommune	Fylke	Bergdistrikt	1: 50 000 kartblad	1: 250 000 kartblad
Meråker	Nord-Trøndelag	Trondheimske		

Fagområde	Dokument type	Forekomster
Historisk Geologi		
Råstofftype	**Emneord**	
Malm/metall		

Sammendrag

[Odin Brun]

Meraker estate

Meraker mining-field

Meraker estate containing the whole Meraker circuit, excluded two farms which are sold from the estate, and a lesser part of the Værdalen circuit, all in the province of Northern Trondhjem, is one of the greatest landed properties on one hand in Norway.

The property has from N. to S. an extention of abt. 50 kilometres and from W. to E. abt. 35 kilometres.

The area is abt. 1280 square kilometres with clear boundaries, mostly frontiers, county & circuit boundaries.

The nearest distance to the Sea, the Trondhjemsfiord, is abt. 35 kilometres.

The water-courses divide the property in several valleys, of which the following are cultivated and inhabited. The head valley Merakerdalen in the direction W. to E., Tevldalen in the same direction, Forbjørkdalen, Dalsdalen & Stordalen from N. to S. and Færsdalen, the last mentioned isolated by the lake „Færen".

The bottom of the valleys is in the head-valley 70—100 metres and in the side-valleys 130—430 metres above the level of the sea.

The valleys are surrounded by a plateau, which is 400—600 metres above the level of the sea. This plateau is surrounded by several big stretches of rocks, partly within and partly on the boundaries of the estate.

The mountains have even and round shapes, the ground can of that reason everywhere easily be passed and is qualified for an easy communication with the rivers and the railway.

The estate has rich natural grandeur. Besides the great landed property there are extensive forests, big water falls, good hunting grounds, good salmon fishing, large Lime-stone & roofing-slate-quarries, rich fields of pyrites of Copper and Sulphur, deposits of Galena cont. Silver and of Molybdenite &c.

A Wood-pulp mill belongs to the estate, based on a yearly production of 10000 tons wet mechanical wood-pulp, and also a manufactory for Carbide of calcium based on 2500 tons yearly.

The communications are very good. By the Meraker railway, which in a length of abt. 35 kilometres from W. to E. is traversing the estate — with 2 railway stations Gudaaen & Meraker — is daily access to the ice free ports of shipment: Hommelviken (58 kilometres from Meraker station) and Trondhjem (81 kilometres from Meraker station). The estate has very good roads and floatable rivers for the wood products.

At the „Trondhjemsfiord," between the railway stations „Hell" and „Hommelviken," the estate owns Muruviken, which has been bought in order to establish an harbour in the future.

Landed property.

The landed property consists of 60 farms and 150 small farms with ground estimated to Mark[1] 107.70.

The cultivated area consists of abt. 8000 roods (abt. 2000 english acres) of acre- & meadow grounds.

The stock of cattle was at the census in December 1900:

133 horses.
665 big cattle.
1238 small cattle.
52 pigs.

This stock was, however, very reduced by reason of want of food in 1900.

The arable land is out on a lease, partly for life, partly to annual tenants, with duty for the tenants to work on the estate, if wanted. The small farms are held in rent, so that the cottars have no duty to work for the farmers.

All the house buildings belong to the estate. Keeping in repair is to be done by the tenants, who have free wood-material for this work as well as for fences, and free fire wood. All taxes on the farms are to be covered by the tenants.

The rent of the farms reached in 1900 Kroner 7668.68.

The rents are yearly raising as the old contracts for life run out. The rent in these contracts is from earlier days fixed unproportionally low on account of the cheap driving- & working prices, which the estate had secured by the working duty of the tenants.

Of contracts for life were at New year 1901 yet 136 running, of which

17 are signed 1811—1870
23 " 1871—1880
19 " 1881—1885
and 17 " 1886—1897

The last years only contracts for 10 years are signed.

Forests.

Measured by the rectangle maps the area below the limit of trees contains 250 square kilometres including cultivated land, marshes, lakes &c. The area, which is covered with good forests is estimated to 150000 roods (37500 english acres).

The limit of trees is between 400 and 500 metres above the level of the sea, in some sheltered valleys a little higher.

[1] Standard of taxation in Norway.

The head growth is fir *(picea excelsa)*. Pine *(pinus silvestris)* in greater extention is only seen in few places.

Considering the situation is so far to the North the forests are growing very well.

The transport is very easy. The rivers „Tevla," „Kobbervatnet," „Dalaaen" and „Torsbjorka" are most of them floatable, the head-river „Stjordalselven" even to the Frondhjemsfiord. From W. T. the railway is traversing the great forests on the Northern part of the head-valley, so transport to this also can be done.

The forests are this year (1901) inspected and valued by Messrs A. Struksnaes & Anders Nordengen, which gentlemen have given the following rapport:

At the instance of the Administration in the company Meraker Brug & Carbid-fabrik the undersigned have inspected the forests in Meraker, belonging to this estate, in order to give an estimation.

Taking into consideration the season and the proportionally short time we had to value this great property, we think, however, to be so familar with the property that we have got the real opinion of the value of the estate.

By the estimation of a forest-estate the conditions for sale and work, the quality and growth of the forest have the final decision.

As to the conditions for working these are very favorable, as four floatable rivers for transport of pulp wood run through the property. The forest is in great tracks growing well, it is thick and partly of great demensions.

As to the conditions for sale we have taken it for granted, that the yearly wood-production is used in the pulp mill and have calculated the material at Meraker after the price at the Drammen rivers.

The forests being worked rationally 5000 dozens can no doubt yearly be cut down without disparaging the forests. By this quantity we think it possible to get 8000 à 10000 tons of wood-pulp and after the present prices, we have calculated the material for 1 ton pulp delivered pulp-mill à Kroner 12,00. From this amount must be deducted the working expenses in the forest Kr. 4.00; nett is thus Kr. 8.00 per ton pulp, that is a yearly profit of the wood of Kr. 64000.00 à 80000,00, — surely the last amount. The present working expenses are at least $^1/_4$ too much.

Supposing that from the forests timber of small measures — say $5^1/_2$ metres in length & 16 centimetres top diameter — should be cut down, we feel sure that 112000 dozens might be taken and even if a great part of these should be sold elsewhere, the nett price can be fixed at least at Kr. 10,00 a dozen, which makes a sum of Kr. 1 120 000,00.

Estimating after the map in hand the different valleys which traverse the property, we amount the forests to contain 150000 roods of good growth and have calculated 9 trees to be taken per rood of the forest thus reduced.

By our calculations we have assumed a rationed working in the forests.

The want of the tenants is thought to be covered by the wood of foliferous trees, waste wood from the felling of timber, and the forests of firs.

p. t. Drammen 21th March 1901.

Water-course.

The supply of water-power is exceedingly good.

Tevla-river from Sweden is traversing the head valley. It is united with the rivers Skurdalsaaen from „Skurdalslake," Storkjærringaaen from „Storkjærringlake" and Lillekjærringaaen, all from the mountains in E. & N.; „Tevla" is also united with Kobberaaen, which runs from the great lakes „Halsjøen" & „Fjergen."

The head-river, which is now named Stjørdalselven, gets its supply later on from S. from Dalaaen with the important tributaries Klukselven, Gilsaaen, Horraaen &c., and from Torsbjørka with the tributaries: Vattenelven, Gaaselven & Tverelven. Later on in the valley the head river is united with Funna from „Fundlake" and with several other tributaries.

The districts of rainfall is

for Tevla water-course abt.	150	square kilometres
„ Kobberaaen	150	—
„ Dalaaen	180	—
„ Torsbjørka	150	—
„ Stjørdalselven (Nustadfos)	650	—
„ Funna	90	—

The yearly average rainfall is on Meraker station 918 millimetres and the minimal flow of water a second:

in Tevla	0,5—0,7	cubic metres
„ Kobberaaen	3,5—4,0	—
„ Dalaaen	abt. 1.0	—
„ Torsbjørka	„ 1.0	—
„ Stjørdalselven (Nustadfos)	„ 4,0	—
„ Funna	1,0—1,5	—

The rivers „Tevla," „Kobberaaen," „Torsbjørka" and „Stjørdalselven" are in industrial purpose regulated with dams in the lakes „Skurdalssjøen," „Halsjøen," „Fjergen" & „Vatnet"; „Dalaaen" & the tributaries „Kværnskaara" & „Klukselven" have dams for floating of timber; for the mining work dams are built in „Damtjernene" on „Grubefjeld" and „Damtjern" on „Gilsaavola."

By the aid of a dam at „Fundsjøen" „Funna" can be regulated by moderate expenses.

In the reservoirs

	Area:	Hight of dam:
Skurdalssjøen	2,60 sq. km.	4,00 m.
Halsjøen	3,25 - -	3,75 -
Fjergen	11,45 - -	4,50 -
Vatnet	0,33 - -	2,25 -

65 millions cubic meter of water can be stored, and if wanted more reservoirs can be established.

The rivers mentioned have several splendid water-falls, which easely can be prepared for industrial purpose.

The most important of these water-falls are:

in Tevla:	Tevlafos	abt.	200 H. P.
„ Kobberaaen:	Øvre Kobberaafos	„	5500 —
	Gjössfossen	„	2400 —
	Nedre Kobberaafos	„	3000 —
„ Stjørdalselven:	Turifos	„	2000 —
	Nustadfos	„	1200 —
„ Fuana:	Fundfossen	„	1000 —
		abt.	15300 minimum H. P.

These water-falls — except „Fundfossen" — have regulated flow of water, as they are getting their supply from the above mentioned dammed lakes. Besides there are many small water-falls with important hight and good flow of water.

A Wood-pulp mill disposes of „Nustadfos", and at „Nedre Kobberaafos" is erected a manufactory for Carbide of calcium: the other water-falls, representing 12000 by 13000 H. P., are not used at present.

Hunting & fishery.

The estate has very good hunting grounds especially for elk, hare and ptarmigan. The tenants, who have earlier driven hunting & snaring, are said to have had an income of abt. Kr. 4000,00 à 5000,00 brutt. a year. The estate has now an exclusive priviledge of this hunting itself.

„Stjørdalselven" is rather good for the salmon fishing; this river is now leased to Englishmen at a yearly rent of Kr. 2700.00, this fishing gave in 1900 a nett profit of Kr. 2160.00.

There is besides good trout fishing in most rivers and lakes.

Lime-stone.

Big lime-stone quarries are found in several places of the property. Some rather important lodes are worked at „Raukjølen" & „Høgaasen," abt. 3 kilometres from Meraker railway station. In these lodes 12500 tons of lime-stone have been broken out 1899—1901, of which 8500 tons have been sold to swedish cellulose-mills with very good profit.

The lime-stone is of exceedingly pure quality, it contains according to analysis from Mr. L. Schmelck, town-chemist of Christiania:

Carbonate of lime	96,67 %
Magnesium	0,43 „
Oxyd of iron & clay	0,30 „
Undecomposable (substantially Mica)	2,60 „

Roofing slate.

Fine slate of very good quality & colour is found especially in the middle of „Torsbjorkdalen." As a trial slate has been worked the last years at the farms „Brænnan" & „Solbakken," where excellent quarries have been opened.

The deposits of slate are so extensive, that a considerable work of roofing slate can be established.

Industrial establishments.

I. Mechanical Wood-pulp mill.

At „Nustadfos", abt. 1 kilometer from Meraker railway station, a cold grinding pulp mill with 4 stones was established during the years 1886—1889. This mill was 1900—1901 enlarged with a hot grinding mill with 2 stones.

The mills get their supply of water from „Stjordalselven." The water is running to the mills with a hight of 19.5 meter through a tunnel 55.0 meter long and a piping abt. 50.0 m. long & 3.0 m. in diameter.

The mills have 7 turbines of abt. 1400 eff. H. P., 4 cold grinders of 625 H. P., 2 hot grinders of 600 H. P., separate driving turbine of 150 H. P., 2 pat. refiners, 4 horizontal refiners, 3 centrifugal strainers, 22 flat strainers, 13 pulp-machines, 4 hydraulic presses, 2 packing presses, 2 double bark-planes, 1 boiler for brown pulp, heating by steam, electric light and besides complete equipment of all kinds.

Separate shop for repair work — with turning-lathe, drill-machine &c. &c. — belongs to the establishment as well as premises for foremen and workmen, store-houses &c.

The mills are based on a yearly production of 10000 tons wet wood-pulp.

The timber is taken from own forests from which it can be floated to the mills. Timber can also at moderate prices be bought from the swedish districts close by.

The wood-pulp is as a rule shipped via Hommelviken, to which place the railway tax is Kr. 2,60 a ton.

II. Carbide of calcium manufactory.

This was built in 1889—1901 at the junction of the rivers „Tevla" & „Kobberaaen" abt. 7 kilometres E. of Meraker railway station.

The manufactory gets its supply of water from „Kobberaaen," where a rather big dam is built. From this is the water made to run to the manufactory in a piping abt. 320.0 m. long & 1,7 m. in diameter with a hight of fall of 81.0 m.

In the factory-buildings 2 turbines (from Escher Wyss & Cie, Zurich) each of 1500 eff. H. P. are installed; to these turbines are coupled 2 dynamoes for alternating current, each of 925 K. W., and 2 dynamoes for direct current, each of 70 K. W. The dynamoes work as well the smelting furnaces as the motors for the crushing- & cleaning departments, the rope railway and the electrical light.

The establishment has 8 smelting furnaces for carbide of calcium, a complete crushing department (from Grusonwerk, Magdeburg) for coke & lime, a continual lime-

furnace (from F. L. Smidth & Co., Copenhagen), separate cleaning-department, side-trace to the Meraker railway and rope railway to the factory, premises for manager & foremen, 3 barracks for workmen, store-houses &c.

The manufactory has been planned by Siemens & Halske A. G., Berlin, which firm has delivered all electrical machinery.

The establishment is very solid and excellently furnished in all directions. It is based on a yearly production of abt. 2500 tons of Carbide of calcium and on supply of lime-stone from their own quarries close by.

The machinery has been tried, but the manufactory has not yet been in regular work, partly on account of the difficulty on the money market, partly on account of the low carbide prices.

III. Saw-mill.

At „Tovmodalen", half way between the railway stations Meraker and Storlien, a removable saw-mill is established with a new locomobile engine of 12 eff. H. P. and a double timber circle, especially based on sawing of railway sleepers and timber from the neighbouring forests.

IV. Brick-work.

The last years a small provisional brick-work has been driven close by the pulp-mill for preparations of bricks used to the new building at the Carbide manufactory & the pulp-mills, belonging to the estate.

The brick-work has a locomobile engine of 10 H. P. and 2 clay-mills.

Good clay-deposits are found in several places. When the now projected rope railway to Meraker railway station is ready, a brick-work — based on sale of bricks to Jämtland (Sweden) and Trondhjem — will most probably pay.

Meraker mining-field.

The working of Selbo Kobberværk.

The Meraker mining-field has a great richness of good deposits of pyrites of Copper and pyrites of Sulphur containing Copper.

The mining-field is geologically examined, the result of which examination is to be found on the Geological map of D. Meraker,[1] published at the public expense, in professor Kjerulf's book „Merakerprofilet" in Dr. H. Reusch's book „Geologiske Iagttagelser fra Trondhjems Stift" and also in Mr. Horbye's book „Merakers Skifre" to which books we beg to refer.

The geological behaviour of the ore — in clay-mica slates traversed by diorite — is the same as in the best norwegian Copper districts „Roros" and Sulitelma: the lodes contain pyrites of Sulphur, pyrites of Copper and Magnetic pyrites, mixed in various proportion.

Two typical deposits can be destinguished: that of pyrites of ore, soft ore, and rock ore, hard ore. The former chiefly contains pyrites of Sulphur, more or less mixed with pyrites of Copper and Magnetic pyrites; the latter contains pyrites of Copper spread in the rock, as a rule mixed with Magnetic pyrites, seldom with pyrites of Sulphur.

The deposits of soft ore are mostly found on the West side of the valley „Torsbjørkadalen", from which they run in the direction of S. to the „Lillefjeld mine", most probably they are combined with the large deposits of Diorite in the western mountains of Meraker „Fondfjeld", „Mundfjeld" &c.

The deposits of hard ore appear in S. at „Dronningens mine" and continue along the valley of „Dalaaen" on both sides of this and then reach towards N. to the lake „Fjergen", with eruptives not far away.

A strike in the direction N. S. and a pitch abt. 15° are common to both deposits; the lodes follow in the whole the strike and pitch of the rock.

A single deposit „Sagskjærpet" contains a little metallic Copper and Chalcocite.

In the rock „Store-Kluken" and at „Skikkerbossen" in the valley of „Torsbjørka" important lodes of Galena cont. Silver and at the „Son-Vandene" Molybdenite are found.

The mining field has been known and worked since the middle of the eighteenth century.

The Selbo Kobberværk, which in 1743 was established in order to work the Copper mines in the neighbouring districts Selbo and Tydalen, and also did it with very bad results, moved successively the work to Meraker after the rich Copper deposits of Meraker by a prospecting in 1746—1751 had been found out.

[1] Printed in „Nyt Magazin for Naturvidenskab" vol. XI p. 92—106.

The Selbo Kobberværk during the years after 1746 took up several mines in the Meraker-field: in 1747 „Kongens-" & Dronningens" mines, in 1748 „Sonvand" mine, in 1751 & 1760 „Lilletjeld" mines, in 1769 „Hammerskal" mine, in 1771 „Gilsaa" mine, i 1820 „Fondfjeld" mine, in 1834 „Forsbirk" mine and also a lot of less important mines & claims.

The mines in Selbo and Tydalen were worked to 1799 resp. 1801, which years the working was stopped.*)

The ore from the Meraker field was until 1770 transported to the smelting-furnace at Selbo. In 1771 the first smelting-furnace at Meraker, Gilsaa furnace, was established, and in 1779 Tydal furnace.

The furnaces at Selbo and Tydalen received yearly a considerable quantity of ore — estimated after the want of the furnaces — from the mines at Meraker, even after the „Gilsaa" furnace was opened. This supply of Meraker ore has influenced very much upon the average output of Copper at the furnaces at Selbo & Tydalen: the percentage of Copper at these furnaces raised proportionally to the quantity of ore delivered from Meraker. During the years 1713—1740, in which period the furnace at Selbo only worked Copper ore from the mines outside the Meraker district, the abstracts of the treating only show an average percentage of 1,.. % refined Copper; during the period 1741—1800, when the furnaces at Selbo & Tydalen got the following supply of ore from the Meraker mines, the result was:

	Percentage:	*Ore from Meraker:*
1741—1750	— $2_{,92}$ % refined Copper	— $25_{,4}$ % of the ore smelted
1751—1760	— $3_{,42}$ - — —	— $47_{,6}$ - —»—
1761—1770	— $4_{,66}$ - — —	— $59_{,9}$ - —»—
1771—1780	— $3_{,14}$ - — —	— $14_{,0}$ - —»—
1781—1790	— $3_{,72}$ - — —	— $44_{,9}$ - —»—
1791—1800	— $3_{,52}$ - — —	— $31_{,1}$ - —»—

The abstracts from „Gilsaa" furnace, which only worked ore from the Meraker mines, show from 1771—1800 an average percentage of $5_{,77}$ % refined Copper.

From 1801 the Selbo Kobberværk has as mentioned only worked the deposits of the Meraker field, wherefore the result is very satisfactorily.

The quantity smelted at the Selbo Kobberværk during the years 1713—1886 is:

at Selbo furnace	32,768 tons of ore	— $1,013_{,9}$	tons of refined Copper
- Tydal —	8,063 —»—	— $270_{,3}$	—»—
- Gilsaa —	67,767 —»—	— $3,174_{,9}$	—»—
- Meraker**) —	57,693 —»—	— $2,935_{,8}$	—»—
Total	166,291 tons of ore	— $7,394_{,9}$	tons of refined Copper.

The average of the ore is thus:

at Selbo furnace 3,094 % refined Copper

*) The work at Tydal furnace was later on tried in the years 1828, 1829, 1830 and 1885, but at a loss.
**) Established 1828.

at Tydal furnace 3,353 % refined Copper
- Gilsaa — 4,685 - —
- Meraker — 5,089 - —

The ore from the Meraker mines, smelted at „Gilsaa" and „Meraker", has given an average af 4,871 % refined Copper — fines & slimes included.

This result giving the percentage of refined Copper won at the furnaces, not the theoretical alloy of the ore — which must be observed — shows that the deposits of Meraker are most valuable as to the contents of Copper.

After professor Vogt's book: „Kobberets Historie" (p. 112) the percentage of Copper of the cleaned and dressed ore at the following well known Europian Copper mines is:

Germany, Mansfeld . . . . . $2_{,5}$—$3_{,0}$ %
Spain, ore treated on the spot . $1_{,75}$—$2_{,0}$ -
Export ore . . . . . $3_{,0}$—$3_{,5}$ -
Sweden, Falun & Åtvidaberg . $3_{,4}$ -
Kafveltorp . . . . . $5_{,2}$ -
Norway, Røros . . . . . $5_{,0}$ -
Sulitelma . . . . . $6_{,5}$—$7_{,0}$ -

The smelting ore from the Meraker field has — the smelting loss not included — a relative percentage af $5_{,0}$—$7_{,0}$ % of Copper (cfr. also „Kobberets Historie" p. 112.)

The ore smelted at Selbo Kobberværk is to be divided on the different mines and furnaces as follows:

1713—1895.	Selbo furnace tons.	Tydal furnace tons.	Gilsaa furnace tons.	Meraker furnace tons.	Total tons.
From Selbo & Tydal mining field:					
Selbo, Prince Christian, Kjoli and other mines	23,049	5,251			28,300
From Meraker mining field:					
Lillefjeld mine	2,947	58	62,733	41,688	107,426
Torsbirk —				13,595	13,595
Gilsaa —	874	2,754	3,815		7,443
Kongens —	4,204		48		4,252
Dronningens —	1,565		659		2,224
Fondfjeld —			340	1,493	1,833
Langsund —				591	591
Sonvand —	97				97
Vægterhaug —			49	39	88
Hammerskal —			63	10	73
Dalaa claim			33	32	65
Several other mines & claims	32		27	245	304
	32,768	8,063	67,767	57,693	166,291

The alloy of Copper in the ore from the Meraker mines has of course also varied. The alloy has partly shown different contents in the various mines, partly also in the same mine, where richer and poorer lodes have been found. For longer periods the ores from the various mines have been separated at the furnaces, so that the contents of Copper in the ore from the various mines could be seen.

1. Kongens- & Dronningens mines:
   3,947 tons of ore, smelted at Selbo furnace 1748—1760, gave in average
   $4_{,50}$ % refined Copper.
2. Gilsaa mine:
   3,000 tons of ore, smelted at Lydal furnace 1780—1800, gave in average
   $5_{,10}$ % refined Copper.
3. Torsbirk mine:
   11,943 tons of ore, smelted at Meraker furnace 1831—1862, gave in average
   $4_{,00}$ % refined Copper.
4. Lillefjeld mine:
   104,420 tons of ore, smelted at Gilsaa & Meraker furnaces 1771—1895 gave in average
   $5_{,01}$ % refined Copper.
5. Fondfjeld mine:
   1,830 tons of ore, smelted at Gilsaa & Meraker furnaces 1820—1881 gave in average
   $2_{,5}$—$3_{,0}$ % refined Copper.

From the other various mines & claims, for instance: „Vægterhaug" mine, „Hammerskal" mine, „Mandfjeld" mines, „Langsund" mine, „Dudu", „Ebba" &c. no separate statements are found. Of this mines can only be said that „Mandfjeld" mines are situated in a rich field of pyrites af Sulphur, which at the surface shows arsenic free pyrites of Sulphur containing ca. $1_{,5}$ % Cu. & $46_{,}$—$48_{,0}$ S. „Langsund" mine gave a very rich and pure Copper ore. A closer prospecting of the other mentioned mines & claims has not been done.

The percentage of ore aganist country rock broken out in the mines is:

at Lillefjeld mine (during the years 1837—1895)

Nr. 1 quality ore	$19_{,08}$ %
- 2 — -	$16_{,18}$ -
Concentrating -	$5_{,84}$ -
Slimes	$0_{,93}$ -
Hand jigged ore	$2_{,81}$ -
Smelting ores	$44_{,24}$ %
Pyrites ($2_{,5}$—3 % Cu. abt. 42 % S.)	$12_{,55}$ -
Total ore	$56_{,79}$ %
Balance country rock	$43_{,21}$ -

at Torsbirk mine: (during the years 1837—1871)

Nr. 1 quality ore	$17_{,71}$ %
- 2&3 — -	$14_{,78}$ -

Concentrating ore	2,79 %
Slimes	0,55 -
Hand jigged ore	0,66 -
Smelting ores	36,00 %
Pyrites (2,0 à 2,5 % Cu. abt. 40 % S.)	10,59 -
Total ore	47,81 %
Balance country rock	52,19 -

During the years 1837—1865 the Lillefjeld mine has produced 2,10 % of bar Copper out of the entire rock broken (Country rock & concentrating goods included).

The following is a comparative scale of some of the best known mines taken upon the same basis (Professor Vogt: „Kobberets Historie", p. 104):

Mansfeld, Germany			0,5—0,6 %
Atlantic & Osceola	Lake-field		0,6—0,7 -
			1,20—1,40 -
Falun, Sweden			1,25 -
Aamdal	Roros	Norway	1,4 -
Mug mine			1,16 -
Storwarts mine			1,85—2,3 -
Sulitelma			2,3 -
Ani, Japan			1,25 -
Tharsis	Spain		2,0 -
Rio Tinto			2,10 -
Tamarack & Quincy	Lake-field		2,5 -
Calumet & Hecla			3,0 -
Montana-field			3,0—3,5 - (?)

According to the statements above the work of the Meraker mines has shown that these mines as to the alloy of the ore belong to the richest Copper mine i Norway, and that they in such respects are not inferior to several well known foreign mines.

As mentioned before the economical result of the work at Selbo Kobberværk during the first periods was anything but profitable. The poor mining field at Selbo and Tydalen, which at that time was worked, could give no better result; from the abstracts of the smelting furnaces can be seen that the ore worked at Selbo furnace only gave:

1713—1720 — 1,84 % refined Copper
1721—1730 — 1,55 - — —
1731—1740 — 1,45 - — —

With this poor Copper ore the working expenses and the great Government taxes, which the Copper mines at that time had to pay, could not be covered*)

*) Tithe, duty & accise. These taxes amount for the years 1713—1740 abt. Kroner 300,00 a ton dressed Copper. The taxes were as a rule later reduced, but they did not cease till 1840. Selbo Kobberværk has althogether paid for such taxes abt. Kr. 316000.00.

The working at Selbo was therefore stopped 1726 with a loss of Kroner 96000.00 — a considerable amount with regard to this time and the extent of the work.

The work was again tried in 1736. In 1737 the properties were sold to a new company, which by a more rational working tried to balance the budget. Not alone at Selbo and Tydalen but also in the surrounding parts of Meraker a rational prospecting as to new deposits was made. By these trial works the rich deposits at the Meraker field were found, — these deposits by which later on Selbo Kobberværk were brought out of all economical difficulties and made a very profitable business.

The first mine found at Meraker, „Kongens" mine, was taken up in the years 1746 –1747 and in the following years several other mines in the Meraker-field were worked. The ore from these mines raised the Copper output at Selbo furnace to a considerable percentage, not known earlier. The work was, however, still improfitable until 1749, which year gave a very little profit (abt. Kr. 1600.00). The years 1751 & 1753 also gave a little profit. As long as the main work, however, was at Selbo & Tydal mining field the working brought as a rule great losses every year. During the years 1713—1750 the total loss of this work has been Kroner 227000.00.

In the year 1760 the economical position of the mines has taken a turn: the Meraker mines, „Kongens" mine & „Dronningens" mine, were rationally worked, and in this year the well known „Lillefjeld" mine was taken up. During the period 1761—1770, in which period abt. 60 % of the ore treated at Selbo furnace was delivered from the Meraker mines, the percentage of Copper rose to 4,66 % and the profit for this period to Kr. 80000.00.

After the working of the Meraker mines has been commenced the results were more gratifying year after year, and the abstracts of account show for a long series of years grand profits.

The following table will show the profits realized from 1771—1880 inclusive in periods of 10 years:

	Net. profit.		Dividend.
1771—1780	Kroner 308250.00	—	$51_{,9}$ %
1781—1790	„ 404700.00	—	$58_{,2}$ -
1791—1800	„ 237500.00	—	$38_{,3}$ -
1801—1810	„ 677500.00	—	$130_{,0}$ -
1811—1820	„ 124000.00	—	$30_{,8}$ -
1821—1830	„ 176500.00	—	$40_{,6}$ -
1831—1840	„ 250200.00	—	$41_{,6}$ -
1841—1850	„ 276800.00	—	$42_{,4}$ -
1851—1860	„ 462600.00	—	$69_{,7}$ -
1861—1870	„ 332500.00	—	$48_{,2}$ -
1871—1880	„ 362500.00	—	$56_{,6}$ -

The total profit realized by the Selbo Kobberværk & the mines controlled by them from 1713—1889 was . . . . . Kr. 3528000.00

Selbo & Tydal mines have given a loss of . . . . . „ 227200.00

Total profit . . . . . Kr. 3300800.00

or in square figures a nett profit on the Meraker mines of 3½ Millions of Kroner.*)

Owing to the great price fall on the Copper market in the middle of the eighties, the promising work was suddenly stopped, as no profitable work could be driven without great and expensive new buildings as well in the mines as in the smelting plant.

The system of financing the mines — as all other norwegian mines at this time — was by quarterly calls upon the partners, who got the annual dividend paid in bar Copper; all the Copper being in that way devided year by year, therefore no reserve or sinking fund existed to tide the mines over the time when Copper was down.

If the work should be continued the necessary capital had to be raised either proportionally by the partners or by loan. With the uncertain chances on the Copper market at that time the company did not risk new capital in the mines; it was thus concluded that the Copper mines should be stopped till the prices on the market had been fixed, and on account of the good prices of wood pulp a Wood pulp mill at „Nestadlien" should be established in order to make use of the forests belonging to the estate, as these forests were no more wanted for the mines, which in 1880 had been connected by rail with Hommelviken & Trondhjem, from which places coke to the smelting furnaces at moderate terms could be imported.

The mines were stopped in 1887. The very same year the reopening of the mines was earnestly discussed and in 1888 new winding-engine & pump-gear for „Lillefjeld" mine was bought.

Before the projected reopening of the mines the Meraker estate were sold to Mr. Astrup, the late cabinet minister, who successively bought the shares of his partners and in 1889 was the sole propriator of the estate. The work of the mines was opened but in such way that the result was a great loss of money. Skilled administration of the working and the necessary plant for transport of the ore were not at hand, and the smelting of the ore was done at the antiquated furnaces at Meraker. All the good chances for a profitable work at that time were lost. The work was again stopped in 1895 and has later not been taken up.

The good economical result of the work of the Meraker mines by the Selbo Kobberværk is to be observed the more because the mines were not worked on favorable conditions. Besides the fact, that the work was done with primitive appliances and methods, which increased the expenses, the mines have also in other respects been worked under conditions far different from that of the present time.

First the bad communications as well within as outside the mining field must be considered. The ore had to be transported to the smelting furnaces for miles over trackless

*) In „Kobberets Historie" (p. 209 & 210) Professor Vogt has approximately estimated the nett profit of the Selbo Kobberværk to Kroner 1620000,00. — The above mentioned amount Kr. 3528000,00 taken from the exact account of the work itself is absolutely correct. Professor Vogt has also in a later published book „Norges Bergværksdrift fl 1814—1899 (p. 21.) put in the amount mentioned, the correctness of which is thus stated.

The account books &c. after 1726 are all kept among the public archives at Trondhjem.

fields and not very accessible mountains and the refined Copper from the furnaces had, straight down to the first decenniums of last century, to be transported by pack-horse, as there were no roads. At the furnaces at „Gilsaa" and „Tydalen" the „black-copper" was until 1800 first transported from these furnaces to the refining furnace at „Selbo", resp. 50 & 25 kilometres, and afterwards abt. 60 kilometres to Trondhjem. The refined Copper was later on transported by pack-horse through the Meraker valley, abt. 100 kilometres to Trondhjem. On the same unpracticable and very expensive way all articles of consumption, provisions &c. were transported. Later on roads were made with great expenses in the most used routes but it did not prevent the expensive horse-transport.

Before the Meraker railway was opened in 1880 the only access from the mining field to the Sea was the high road. Until this time the transport-expenses of Copper from Meraker furnaces to Trondhjem amounted Kr. 25.00 and Kr. 27.50 a ton.*)

From the mines to the furnaces no other way of transport but by horses has been used.

The transport in the mines was also rather primitive. Besides the old-fashioned „horse-ways" as well rock- as water-hoisting had been done by „hand-crabs" till very lately. Even „Lillefjeld" mine, which is the latest worked of the mines and has the best machinery, had only indifferent appliances for hoisting- & pumping purposes, in spite of a water power of 15 H. P. is at hand in the very mine.

The greatest hinderance for a rational and economical working of the deposits was for all that the working on account of want of fire wood had to be limited.

As most other Copper mines in this country, the Selbo Kobberværk was obliged to base the work only on smelting by charcoal. The supply of such coal was however, so limited, that the work could not be based on the productivity of the mines but had to be arranged so, that no more ore was broken out than the quantity which could be smelted by the disponible quantity of charcoal. To remedy this, which was very unfortunate for a profitable working of the mines, it was necessary to establish and work several small furnaces far from each other instead of a single one; three smelting plants at „Selbo", „Tydalen" and „Gilsaa" where thus at once in work. The transport was so expensive that all the coals of that reason could not be brought only to one place, the royal previlegies also hindered such an arrangement. By such a scattered and at each place limited smelting the expenses were of course too high.

As the „Lillefjeld" mine had come to a rational work the ore was so abundant that this mine alone without difficulty could deliver the whole quantity, which the furnaces could receive and work. The working at „Kongens", „Dronningens" & „Gilsaa" mines had then to be stopped as it was impossible to get charcoal for the smelting of the ore from this mines.

That the working on account of want of coal for smelting had to be limited only to „Lillefjeld" mine caused, that the attention was only given to this mine almost during one whole century, so that a lot of promising mines and claims (abt. 50) which are scattered about the mining-field only has been a little developed. Significant of the little interest,

*) The Copper was then taken by carriage to „Stjørdalshalsen" and from there in a boat to Trondhjem.

which was paid to the other mines than „Lillefjeld" is, that of the quantity of ore smelted during the years 1805—1895

82,1 % is delivered from „Lillefjeld" mine
14,2 - - — „ „Torsbirk" —
and only 3,8 - - from the many other mines & claims.

The charcoal was in Selbo and Tydalen mostly delivered from private forests. As the working was moved to Meraker for good great forests- and landed properties were during the years 1777—1812 successively bought when the economical situation of the work made it possible, so that the „Selbo Kobberværk" at last owned the whole Meraker mining-field with all ground-, water-, forests and other rigths. These properties are still belonging to the Meraker estate.

Several well known men, skilled in mining, have all the openion that a reopening of the mining at Meraker has claims on attention.

The lodes are on no place emptied and a great many new promising lodes are at hand.

By means of the good and cheap communications now established, with the easy access for transport (railways or rope railways) which the terrain in this mining field gives, with the reasonable wages*) and with the extraordinary good supply of water power, a mining work with proper modern technical appliances has the best chances to be successful, and could work under far more favorable circumstances than that of Selbo Kobberværk.

The easy and cheap connection with the export harbours: Hommelviken & Trondhjem, to which places the railway freight is resp. Kr. 1.70 og Kr. 2.20 a ton ore, is compared with the earlier terms of an absolutely conclusive importance for the economy of the mines. The railway has not alone reduced the transport expenses to a minimum and obviated the obstacles which the limited supply of fire-wood put in the way of a rational working of the mines, but it has also made it possible to have the poorer kinds of ore (pyrites of Sulphur), which before as valueless had to be left back at the mines, profitably sold.

Besides this the alloy of the ore can by modern plants for the treatement of the ore be extracted more completely than by the old smelting process, which was used at Meraker, so that the smelting loss now will be lesser than before**) and the precious metals, which the Meraker ore contain (in refined Copper 0,031 % Silver and in the Silver 1,16 % Gold.) can also now be profitably used.

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*) At present Kr. 2.00 a Kr. 2.50 a day.

**) The slags from the earlier smelting contained after analyses made 0,2 to 2,1 % of Copper

Having an abundant supply of water great advantages are also given in the good progress of the lectricity.

Capital & enterprise united in order to make use of the natural grandeurs, Meraker mining field will most probably also in the future be able to keep the splendid traditions, which Selbo Kobberværk under many difficulties has established.

Administrationen for A/S Meraker Brug & Carbidfabrik
Drammen, November 1901.

R. Rynning. **Anders Borresen.** **C. O. Lund.**

Odin Brun.