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Tittel

Malsådalens kobberfelter

Forfatter

Vogt, J.H.L.
Guldberg, Ansgar
Nannestad, F. Smith, H.H.

Dato År

Bedrift (Oppdragsgiver og/eller oppdragstaker)

Overdirektør Holmsen
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A/S Elektrokemisk

Kommune

Verdal

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Fagområde

Geologi
Foekomstbeskrivelse

Dokument type

Forekomster (forekomst, gruvefelt, undersøkelsesfelt)

Sagvoldhaugen
Malsåfeltet

Råstoffgruppe

Malm/metall

Råstofftype

Cu, Zn, S

Sammendrag, innholdsfortegnelse eller innholdsbeskrivelse

Guldberg 04.10.1906 og 16.08.1907 (BA nr. 319) : Korte beskrivelser av grubefeltet på norsk og engelsk. Anbefaler en større prøvedrift.

Vogt 25.07.1909 (BA nr. 320) : Kort beskrivelse av feltet, mer detaljert om Sagvoldhaugforekomstene. Gir et positivt inntrykk, dveler ved nødvendigheten av riktige analyser.

Nannestad 06.02.1914 og 24.06.1914 (BA nr 2200) : Gjennomgang av 4 rapporter som han synes ikke er særlig overensstemmende. Anbefaler befarung.

Etter befarung ansees feltet som ikke drivverdig og anbefales avslått.

Smith 25.02.1914 (BA nr 2885) : Gjennongått tidligere rapporter og mener Elektrokemisk A/S ikke bør påta seg å overta prosjektet fra grosserer Røstad.

Samling av rapporter på engelsk A. guldberg 1907, J.H.L. Vogt 1909, W-C. J. Rasumussen 1910, A. Christiansen 1912, J. Winsnes 1870, P. Mortensen 1912.

J. H. N. Værdal 1954

Norges Geologiske Undersøkelser
Bergarkivet
Rapport nr.: 320

ELEKTROKEMISK
SKOROVAS GRUBER

P4-11-54

Malsaadalens Kobbermalmforekomster

(Værdalen)

Efter anmodning af grosserer Th. Røstad, Moss, har jeg netop besøgt disse forekomster.

I Malsaadalen kjendes følgende kobberforekomster:

Sagvoldhaug-forekomsterne;
Malsaa nedlagte kobberværks gruber;
forekomsterne ved Grubestutjernet;
Lillevola Skjærp;
Tyvedalshella (Steindalsklumpen).

Af disse oier herr Røstad samtlige, med undtagelse af to af Malsaa kobberværks gamle gruber.

Beliggenhed: overst oppe i Malsaadalen i Vuku i Værdalen. Forekomsterne ligger fra ca. 340 til ca. 400 m. over havet, i den øvre del af granskov og furuskov (og tildels med skov lige ind ved forekomsterne.)

Veilængde fra Grube (ved stollmundingen ved Sagvoldhaugen) til Værdalsøen: Kjørevei fra Værdalsøen til Volden ca. 26 km.; derpaa ca. 2 km. tarvelig gaardsvei og ca. 10—12 km. skovvei, sam ca. 40 km. Vinterkjørsel kan tildels benytte elvedrag osv., saa man kan indspare noget i kjørsellængde. Hestekjørsel om vinteren anslaaes til 12—13 pr. ton fra feltet til Værdalsøen. Eventuel taugbane (søndenom Leksdalsvandet) til Thronæsbyen ved Trondhjemsfjorden vil ifølge rektangelkartet have en længde af ca. 35 km. Dens kostende anslaaes rent skønsmæssig til ca. kr. 700,000.

Forekomsternes karakter: Impregnationsmalm eller vaskemalm (opberedningsmalm) af kobberkis med noget svovlkis og magnetkis, i ganske lange og mægtige zoner.

Skidemalm kan kun paaregnes i rent underordnet mængde; praktisk talt man det hele kvantum underkastes opberedning.

Malsaa kobberverk blev drevet, om end kun i ganske liden maalestok, nogle aar i tiden omkring 1870. Man smeltede malmen, med udenlandske kokes, i en liden skjæstenshytte paa stedet; derimod havde man ikke noget — eller kun et meget primitivt — vaskeri, hvorfra følgen var, at smeltedmalmen blev yderst fattig. Ved optagelse af bedriften i Malsaadalen maa arbeidet baseres paa opberedning, og ikke paa direkte smeltning.

Forekomsternes geologi: Det herskende strøget er NNO a NO, med middel omkring N 30° O, og faldet er forholdsvis fladt mod øst (ca. 0.30° S). I regelen er faldet kun 15—30° mod øst, enkeltsteds (som f. ex. ved Lillevola), dog mere (ca. 50°). Malmen optræder i skifer (fyllin) — i alle fald ved Sagvoldhauggangen umiddelbart i det liggende far en haard og temmelig kompakt, kvartsrig bergart („haardart“), som jeg foreløbig, uden nærmere undersøgelse betegner som granulit.

Denne haarde, lyse bergart („haardart“), danner en markeret ryg, fra stollmundingen ved Sagvoldbakken til øst for Malsaa kobberverk, i en længde af mindst 2 km. Ryggens længderetning er som strøget, ca. N 30° O.

Sagvoldhauggangens impregnationszone ligger umiddelbart i det liggende far denne granulitryg — altsaa med udgaaende i den lange, men snale myr umiddelbart vest for ryggens fod. (Se det ledsagede kartkroki).

Det bemærkes, at denne slags optræden — i et bestemt lag eller niveau umiddelbart under eller i det liggende far en kompakt haard bergart — kan ajfæntes ved flere af de vigtigste kobbermalm- eller kisforekomster af den trondhjemske type.

Bergarkivet

Detaljer vedrørende Sagvoldhaugforekomsten

Lagbygningen er her meget regelmæssig, med temmelig jævnt strøg (ca. N 30 O) og jævnt fald, omkring 25 eller 30 mod øst (α: 0,30° S).

Afstanden (regnet vinkelret paa lagfladerne) mellem impregnationszonen og den overliggende haarde bergart („haardart“) er kun nogle ganske faa m., muligens lidt vekslende paa de forskjellige steder. Ved synken er afstanden mellem impregnationszonen og den overliggende „haardart“ kun en eller et par m.; andetsteds er afstanden kanske 5 m. eller lidt derover.

Malmzonen er her paavist ved mineringsarbeide paa følgende steder, regnet efter feltets strøgetning, fra syd (ca. S 30° V), mod nord (ca. N 30° O).

I den paabegyndte stoll, som nu er 85 m. lang, og i synk (16,5 m. vertikal plus ca. 15,5 m. paa skraa) fra dagen ned til stollens indre del,

I dagskjæring no. I lige ved synken;

i dagskjæring no. II 90 m. fra synken;

i dagskjæring no. III 330 m. fra synken. = 240 m. fra skjæring no. II;

paa dette mellemparti stikker rustzonen paa adskillige steder op i dagen; resten er dækket med myr; i dagskjæring no. IV 405 m. fra synken = 85 m. fra skjæring no. III, samt ved lidt minering paa begge sider af no. IV.

Fra stollmundingen til dagskjæring no. IV er afstanden = $85 + 405 = 490$ m.; medtages ogsaa lidt afreskning strax nord for dagskjæring no. IV, kan længden sættes til 500 m.

I denne længde optræder impregnationszonen overalt umiddelbart under den overliggende „haardart“, med jævnt stig og fald; og er her desuden fulgt ved saa mange mineringer og afreskninger, at man kan være sikker paa, at impregnationszonen her er kontinuerlig.

Længden nordover efter strøget er marken stærkt tildækket med myr osv.; paa flere steder stikker dog rustzonen op i dagen, og altid umiddelbart under „haardarten“, altsaa fremdeles paa samme geologiske niveau. Rustzonen er her ved diverse smaa mineringer fulgt i en længde af ca. 1 km. fra dagskjæring no. IV, — altsaa ialt i en længde af $1\frac{1}{2}$ km. Det er dog, paa grund af den sterke tildækning med myr og skov — hidtil ikke faktisk konstateret, at impregnationszonen her er ganske kontinuerlig. Vil man være forsigtig, regnes med impregnationszone, først i detaljeret konstateret længde af 500 m. og derefter med tillæg af 250 m. — sum 750 m.

Synkens udgaende over stollniveauet er vertikalt = 28,5 m. Fra synken hæver det udgaende sig langsomt til dagskjæring no. III og VI) som ligger i høide ca. 25 m. over synken (= 50 a 55 m. over stollen; derpaa falder terrenet jævnt og langsomt af (se det ledsagende skitserede længdeprofil langs det udgaende af impregnationszonen.)

Impregnationszonen fører, som allerede nævnt, kobberkis med noget magnetkis og svovlkis. Impregnationszonens mægtighed er, naar ogsaa aldeles fattige partier medregnes, ofte omkring 10 m., men teknisk tal kan man ikke regne med saa stor mægtighed, idet der kun kan blive tale om at afbygge de relativt bedste partier. Disse viser i tverslag ca. 40 m. ind i stollen, videre i synken samt i dagskjæring no. I, II og III, oftest en mægtighed af 4–5 m. Det er selvfølgelig gjenstand for et skøn, hvor mægtigt man paa hvert sted vil regne den relativt gode del af impregnationszonen.

Skønsmæssig kalkyl: Feltets effektive længde sættes til til 750 m.; mægtigheden af den relativt gode del af impregnationszonen til 4 m.; $1 \text{ m}^3 = 3 \text{ tons}$; gjør $750 \times 4 \times 3 \text{ tons} = 9000 \text{ t. pr. m. afsenkning efter faldet}$. Heraf regnes, efter foretagen sortering, 5000 t. som opberedningsmalm. Den gennemsnitlige længde af regnet efter faldet (?) fra det udgaende i dagen til stollniveauet sættes til 100 m. Alene over stollniveauet kan saaledes paaregnes med rundt tal ca. $\frac{1}{2}$ mill. tons opberedningsmalm. Hertil kommer kvantiteten under stollniveauet (det bemærkes, at man kan gaa ind med dybere stoller, men disse blir forholdsvis lange).

Man ser heraf, at man har tilstrækkelig kvantitet af opberedningsgods. Det økonomiske spørgsmaal er ikke kvantiteten, men kvaliteten af opberedningsgodsets gennemsnitlige kobberprocent.

Erfaring har tilfulde lært mig, at man ikke kan bedømme den gennemsnitlige kobberprocent i opberedningsmalm kun ved besigtigelse for øie eller ved mindre gennemsnitsprover, der udkræves omfattende skeidnings- og opberedningsforsøg, som maa kræve maaneders arbejde.

Grovknuser man godset fra den relativt gode del af impregnationszonen og lader det grovknuste gods gaa paa plukbord, saa vil man kunne udskæide nogle faa procent (f. ex. 5 pct. eller tal omtrent af denne høide) som smeltmalm, med mindst 4–4,5% kobber, og en del (efter foreløbigt skøn omkring tredjeparten) som saa fattigt gods, at det ikke kan bære opberedningsudgiften. Den stor masse, altsaa mindst halvdelen af den hele impregnationszone, maa gaa til opberedning, sandsynligvis rationelst efter oliemethoden. Sligen kan anriges antagelig til

10 pct. kobber eller tal omtrent af denne høide. Enkelte vaskemalmspartier med overveiende svovlkis kan holdes ud for sig.

For at faa en foreløbig forestilling om vaskegodsets kobberindhold udtog jeg en mindre gennemsnitsprøve af det udminerede gods hovedsagelig fra tverslaget ca. 40 m. ind i stollen. Der blev taget paa maafaa ca. 1 tons prøver, som efter kobberindholdet deltes efter øiemaal i „rigt“ og „fattigt“. Hver af disse to dele blev omtrent lige store. Af hver enkelt malmhaug blev taget omhyggelig gennemsnitsprøve, efter at det hele gods var blevet grovknust. I den prøve, der før betegnedes som „fattigt“, indgik kanske en trediepart eller halvpert af yderst fattigt gods, som ved behandling paa plukbord kunde kastes: herved vilde naturligvis kobberprocenten i selve opberedningsgodset øges noget.

Tager man middel af resultatet af de to analyser, idet analyse af det „fattige“ gods kun regnes med halv vægt, vil man tilnærmelsesvis faa gennemsnittet paa den relativt rige inpregnationszone i det netop nævnte tverslag.

En saadan enkelt gennemsnitsprøve er dog ikke tilstrækkelig til at danne grundlag for en ordentlig kalkyle.

Ovenstaaende skrives umiddelbart efter mit besøg paa stedet, altsaa før analyseresultatet foreligger.

Stollen er drevet noget i det liggende far selve leiestedet. Jeg foreslaar at det allerede paabegyndte tverslag i stollens bund drives frem til leiestedet. Man vil da i stollen have to angrebepunkter — nemlig i hvert af de to tverslag — for udminering af tilstrækkelig kvantitet opberedningsgods, til undersøgelse baade af kobberprocenten og af opberedningsbetingelserne.

Da inpregnationszonen er saa mægtig, antager jeg at 1 ton brudt gods vil komme paa ca. 2½ krone, — og at følgelig 1 ton opberedningsgods (efter bortplukning af det fattigste) vil komme paa ca. 4 kroner — opberedningsudgiften anslaaes til 4 kroner pr. ton gods, med udbringende 80% (altsaa tab af en femtepart af godsets kobberindhold).

Hvis opberedningsgodset holder gennemsnitlig 2 pct. kobber, skulde efter ovenstaaende forudsætninger 1 ton slig a 8 pct. kobber komme paa ca. 40 kroner.

Grænsen for rentabilitet vil saaledes være ved opberedningsgods (efter bortplukning af det allerfattigste) med omkring 2 pct. kobber.

Jeg kan, før noget analyseresultat foreligger, ikke udtale mig om opberedningsgodsets gennemsnitlige kobberprocent; men jeg vil bestemt tilraade detaljeret undersøgelse af kobberprocenten. Feltet er stort, og raamalmen kan leveres billigt. Under saadanne betingelser bør godsets kobberprocent studeres nøie.

Eventuelt verk vil — foruden transportanlæg — kræve opberedningsverk samt i hvert fald ogsaa en skjerstenhytte, for behandling paa stedet af den skeidemalm, som vilfalde som biprodukt ved skeidningen eller plukbords-plukningen. Desuden bør sligen ogsaa smeltes paa stedet.

Til nærmere oplysning om Sagvoldforekomsten vedlægges:

Kartkopi over feltet samt længdeprofil over forekomsternes udgaende;

Kartkroki over stollen;

profilskitse over synken samt dagskjæring no. I.

Samtlige tegninger er kun skitser, tegnede paa grundlag af nogle maalinge og forresten efter øiemaal (specielt er høidekurvene paa kartkrokien nedtegnede kun efter øiemaal)

De mange andre forekomster i Malsaadalen kan opfattes som seservefelter. Flere af disse synes at have temmelig nøiagtig samme karakter som den ovenfor omhandlede Sagvoldhaugforekomst, hvor forsøgsarbeidet hidtil har været koncentreret. Enkelte af forekomsterne fører derimod, hovedsagelig kobberfattig svovlkis, dog ikke af saadan renhed, at man hovedsagelig kan faa skeidemalm af kis; disse sidste forekomster bliver derfor at tage lidet hensyn til.

p. t. Grunden i Vuku, Værdalen, 25—7 1909.

(Sign.) Johan H. L. Vogt,
professor,
Christiania.



P4-11-53

ELEKTROKEMISK &
SKOROVAS GRUBER

THE MALSAADALEN COPPER FIELDS

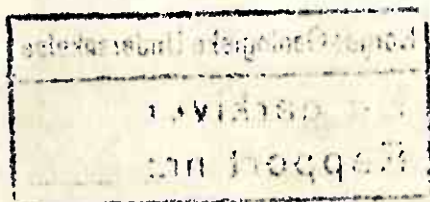
(Værdalen)

belonging to Mr. Thv. Røstad, wholesale merchant at Moss.

Reports

of 4th October 1906 and 16th August 1907 &c
by Mr. Ansgar Guldberg, cand. min. and mining engineer of Kristiania.





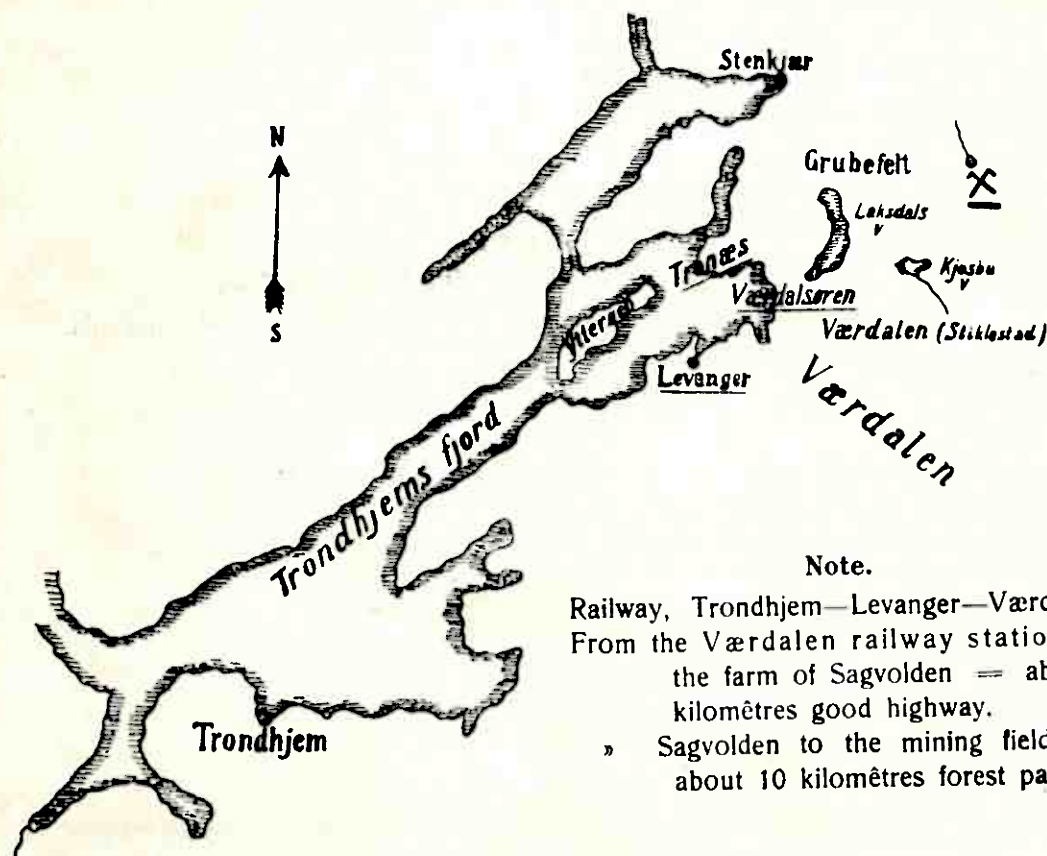
Report

of 4th October 1906 by Mr. Ansgar Guldberg, cand. min. and mining engineer of Kristiania.

For Mr. Thv. Røstad, wholesale merchant at Moss, I have surveyed the above fields and hereby beg to report as follows,

The fields are situated in the parish of Vuku, Værdalen, about 40 kilomètres from the Værdalen railwaystation (about 30 kilomètres high-way and about 10 kilomètres walking path (forest path)). The situation will be best seen from the map-sketch accompanying this report.

The ore is copper pyrites mixed with magnetic pyrites and pyrites. A possible operation of the mines would have to be based on washing ore with operations on a large scale in view. There are in some places richer ores (with 10 to 15 % of copper), and it is very possible that, also later on, one might be so fortunate as to discover richer layers in the same district in the prospects now acquired; but in most of the places where the earth had been hitherto removed and mining undertaken, poor ore was on the whole seen. The question then will be, Do so large quantities of ore exist that operations on a large scale could be carried on? For, seeing that we have in this case to calculate with both a poor ore and a comparatively remote situation, operations on a large scale with washing plant &c. would have to be established, if a future working of the mines were to be paying. I shall revert to this question on conclusion, and shall first mention the various parts that have been hitherto uncovered.



Note.

Railway, Trondhjem—Levanger—Værdalen.
From the Værdalen railway station to the farm of Sagvolden = abt. 30 kilomètres good highway.

» Sagvolden to the mining fields = about 10 kilomètres forest path.

Field I.

a) „The Deposits of Sagvoldhaugsberget“ Quartz lode, embedded in schist, direction N. E., dip towards the South. The dip sometimes is so considerable in some of the lodes in the field that part of the adjoining layer of schist is above the lode, and that layer must in several places be mined away in order to get at the lode.

In this quartz lode pure copper pyrites are speckled without mixture of magnetic pyrites, but rather sparsely — however pretty evenly distributed. I estimate the contents of copper at 5 % in that part of the lode which had been uncovered. The extent of the stratum was from 2—3 mètres, and uncovered in the direction in which it runs, about 7 mètres. I put men to work while I was there to follow the direction of the deposit with uncovering of points at intervals of 10 mètres.

b) A small clearing at a distance of a few mètres. Perhaps a parallel lode.

c) An old „mine hole“ (commenced sink) about 30 mètres from a) in the same direction.

d) „Clearing“. Not mined.

e) Copper pyrites were here found, speckled rather copiously. I estimate the contents of copper here at 8 to 10 %, and evenly distributed. I therefore set going further clearing and mining at this place, which was the one that pleased me best.

At f) and g) only a very little mining was done. There was ore (copper pyrites) to be seen at both places, but in small quantities.

Field II.

a) „The Deposits of Grubestueberget“. Direction N. N. E. The ore is pyrites. In former days this place has been worked a little. But a small distance off (about 10 mètres to the North) is to be found another deposit. Clearing has been undertaken on the surface in a length of about 12 mètres, and a width of about 4 mètres. The chief quantity of the pyrites which here occur in no small quantities in the light is rather impure (at the utmost 30 to 35 % of sulphur), but some parties consisted of almost pure copper pyrites. At this place closer examinations ought to be made.

b) „Grubestuevandet“. At this place an area of about 36 mètres in length, and about 2 mètres in width was cleared. North-Easterly direction. Finely speckled with a mixture of copper pyrites, magnetic pyrites and pyrites. At this place the ore was much poorer than at the other places mentioned.

c—d) On the South-side of the abovementioned lake some clearing and mining had been done at a few places. Here there were some places with very satisfactory copper ore, but everything was as yet too little examined. The afflux of water from the moor and from the lake will, however, prove a great impediment to further trial work, so that I should suggest further work at this place to be put off for the present.

Between the Fields of I and II the Malsaa old copper works are situate, of which remains still exist.

Of all the places mentioned at Fields I and II all the licences are new (announced this summer). The proprietor has — according to statement — announced abt. 70 licences last summer, and only a small part of these have been examined.

There are thus many possibilities in this field. Mr. Røstad also disposes of 2 waterfalls (in these regions), which, as I hear, may be made to yield a total of several thousands of horsepowers.

At Værdalsøren and Tronæs there are good harbours and loading places for ships of considerable draught.

Conclusion,

There being, at several of the places mentioned above a quite fine copper ore, and it being possible, *at many* other places to observe the copper ore on the surface — though the ore is often poor —, and the field being very wide, and there being, as formerly stated, many possibilities, I will absolutely recommend trial operations. Such operations would have to consist in rational investigations over the whole of the field. For this, kr. 30,000, will be needed for clearing and mining work. But as one of course ought to arrange one's self as economically as possible — with cheap management &c — and temporarily only build a cheap barrack (for 20 men and 2 rooms extra), such trial operations hardly would exceed kr. 35,000, including the management. I am of opinion that for this sum one would get a reliable and full opinion of the whole affair, when the work was conducted in the proper manner — sensibly and economically.

All preparatory work ought, in such case, to be made during this winter, so that the trial operation itself might be commenced early in the spring of 1907.

Christiania, 4th October 1906.

Christiania Bergbureau

(Det norske Bergbureau).

Ansgar Guldberg.

P. S.

To-day — 16th October 1906 — I have received a letter from Mr. J. Grunden, Værdalen. He states that things look very promising at that place at Malsaadalen, where I caused a little trial-work to be commenced. The width, he now says, is $7\frac{1}{2}$ mètres, and the deposit may be traced in a length of 870 mètres. He further sends me an average sample from the working place mentioned above, and that sample proves to be of a very good quality.

Christiania Bergbureau

(Det norske Bergbureau).

Ansgar Guldberg.

Report

of 16th August 1907 — after the last survey by Mr. Ansgar Guldberg, cand. min. & mining engineer.

The fields are situate in the parish of Vuku, Værdalen, about 40 kilomètres from Værdalsøren (about 30 kilomètres highway and about 10 kilomètres forest path). The situation will, however, be best seen from the map-sketch reproduced in the present.

At Værdalsøren and Tronæs are ice-free seaports, and — particularly at the last-mentioned place — loading access for ships of large draught.

An aerial ropeway might perhaps be shortened by some kilometres. But if we calculate 40 kilometres and suppose an annual transportation of 100,000 to 200,000 tons, an aerial ropeway will cost about kr. 700,000. For a larger transportation it will be more expensive. For a transportation of towards $1\frac{1}{2}$ million tons per annum, an aerial ropeway will presumably not be able any longer to compete with other means of conveyance.

The territory also is very suitable for the building of a railway line, for which ample power is at hand in the waterfalls described below. The question as to conveyance is mentioned only provisionally here; it must of course later on be made the subject of further discussion.

The ore is copper pyrites mixed with magnetic pyrites, and pyrites.

The ore is found in slate, and the main deposit consists of a wide impregnated zone, in the direction from N. E. to N. N. E., and on an average of very considerable richness. Sloping S. E. to E. In several places also appear „parallel lodes“ (or „parallel zones“).

The contents of copper in the areas of ore hitherto uncovered prove to be — on an average — 2.5 to 3 % Cu. (copper), but in some places richer ore is to be found, up to 10 % of Cu. However the operations will have to be based on „washing ore“ with operations on a large scale in view.

The proprietor, Mr. Thv. Røstad, wholesale merchant at Moss, is the proprietor of a number of „licences“ („announcements“), of which 18 measurements were provisionally acquired at the measuring business this month in the places that have been most worked at in this extensive field.

Field I.

„Sagvoldhaugberget“.

This ore field extends from „Sæterbækken“ near „Malsaa old copper-works“ (in N. E. direction) to „Sagdalsbækken“ near „the barrack“ (in S. W. direction). This area has been worked in several places since my first visit on the spot (September 1906). The result has hitherto been very satisfactory, much ore having been uncovered and laid bare, and everything points to the presence of large quantities of ore. This „zone of ore“ has at several „uncovered spots“ and „cuts“, been followed in a distance of about 950 metres (about one kilometre) in the direction N. E. to N. N. E., and it shows on an average a great richness. At the fourth „cut“ from „the barrack“ in North Easterly direction, I measured the horizontal breadth of „the deposit“ or „ore zone“ at somewhat over 13 metres, with ore evenly speckled over the whole breadth. Notwithstanding this I dare not yet — at the present stage of the matter — state the number of tons of copper ore which in the event of the working of the mine might be calculated upon per cubic metre of lode. Both there are — as is seen — very good prospects of meeting with large quantities of ore, and especially on this area it looks very promising.

There are several large uncovered spots thus,

1) in the neighbourhood of „the barrack“ (abt. 80 metres in Easterly direction); N. E. direction of deposit. Slope Easterly. A small trial cut has been made, and ore found as supposed.

2) About 50 metres in the direction N. E. from 1). The horizontal breadth where the ore was speckled — evenly distributed — now was measured and found to be 6.3 metres. The average analysis of about 100 kilogr. — taken by the undersigned from several tons of ore that had been mined out — gave the following result,

4.03 % Cu. (copper).

(Analysis from Mr. Schmelck,
City Chemist, Christiania).

3) About 100 metres in the direction N. E. from 2). The horizontal breadth impregnated with ore was here somewhat over 6 metres.

The average analysis, made in the same manner as for 2) gave 2.50 % Cu. (copper).

4) About 250 metres in the direction N. E. from 3) called „Pettersen's cut“.

The horizontal breadth impregnated with ore was here measured and found to be somewhat over 13 metres.

Average analysis, made in the same manner as for 2) and 3) gave 0.31 % Cu. (copper). At this „cut“ there was this time more of pyrites and less of copper pyrites to be seen than on my first visit. But the contents have in this place varied rather much; an average analysis, made on samples from the same spot when the trial work last spring was going on gave 4.17 % Cu.

In this connection I may also mention that an analysis from another spot in the same field, where, the first time, very little copper pyrites could be seen, last spring showed, 4.71 % of Cu. I have therefore, to be on the safe side, stated the average contents in this field at 2.5 to 3 % of Cu.

Field II.

„Grubestueberget“.

1) On the South-Eastern side of „Grubestuevandet“ 2 uncovered places are to be found where copper ore appears, but very little work has been done there.

2) On the North-Eastern side of the above lake a trial drift into the rock has been commenced in direction N. N. E. The slope is to the East. (If operations are actually commenced, the drift must be put farther down towards the water). Here the chief mass is pyrites. (mixed with a little copper pyrites and magnetic pyrites). The area of ore hitherto uncovered shows a poor ore, but the extent is very large, it being possible to follow the impregnation zone here for over 20 metres continually in horizontal breadth, and still there is ore along „the sides“ (towards the borders), so that there are prospects of a still greater breadth, which will, then, give a very considerable extent. I should not wonder if in this place one obtained an extent of up to 40 or 50 metres, as the clearings already made have shown that an extremely broad impregnated zone is here to be dealt with.

Only „washing ore“ should, in operations to be established, be here calculated upon. To begin with, operations should be concentrated upon Field I — which I shall mention later on —, and let this Field II, temporarily, remain as a reserve field.

The proprietor, Mr. Røstad, is, as formerly mentioned, the holder of a number of „announcements“ (licences) in the same district, in all 70, the greatest number of which have not yet been worked and surveyed in detail and are not therefore described here.

At the last measuring business, measurements were also given by the Superintendent of Mines for some licences at „Malsaa old copper works“ and at „Søndtjernsholda“ („Lillevola Mine“) and „Tyvdalsfjeldet“ about 1 kilometre to the S. S. E. of „the barrack“. Mr. Røstad likewise has „prospects“ in „Steindalsklumpen“ about 1 $\frac{1}{4}$ hour's walk to the S. W. of „the barrack“, and there is found a large impregnation zone with pyrites. The direction is also here North-Easterly, sloping to the East. The ore that may here be seen in the light (no work has been done here) is poor, and the operations will, no doubt, also here have to be based on „washing ore“. This place is especially well adapted for mining operations — an excellent territory —, where cheap operations might very conveniently be carried on. At this place, then, trial work should later on be commenced, if definite operations for Copper are commenced at Malsaadalen.

But all the fields here mentioned should — to begin with — be considered as reserve fields, and work should, as already stated, be concentrated at *Field I*.

Hitherto the work has been carried on as a work of exploration on the surface to ascertain the presence of more considerable quantities of ore, but now on my last visit I caused a

low adit (2 × 2,5 metres) to be commenced at about 45 metres depth under „Cut No 4“. (This valley is excellently adapted for the transportation). This adit will be very instructive, as it will be made in the direction of the deposits with cross sections at suitable intervals I also intend to mine down, from point 2) a „shaft“ to strike the low adit; I will do this both for the sake of the change of air and on account of the investigation.

By this means ore will be taken out in the operation of the adit itself (and in the working of the shaft). Consequently a very advantageous method of working. This ore will have its full value when a washing establishment is later on made. All ore therefore is ordered to be stocked separately, so that one may have a quantity ready from the first moment when a washing establishment is finally made. There is ample opportunity of obtaining, in close vicinity to the future Mines, water for washing and for motive power. When handling this kind of ore I however suppose that „Elmores oil method“ ought to be used, (and in that case not so much water is required as otherwise).

With regard to motive power, Mr. Røstad disposes of 2 waterfalls in these districts, and when regulated these falls will supply plentiful water for future mining operations on a large scale. There is further easy access to good, big timber from the Public domains close by, at reasonable prices. Also horses and workmen may be had from the district itself.

The wages for common miners hitherto have been on an average kr. 3,00 pr. day, but they will presumably rise somewhat if the number of hands is increased and labourers must be looked for outside the district.

Conclusion,

There being, at several of the places mentioned above, a pretty fine copper ore, and it being possible also at many other places in this large field to see the ore in the light, and, finally, the field being very wide, there are many possibilities for future operations on a large scale. And as there has been already, especially in Field I, uncovered large areas of ore worth working, one is justified in placing great hopes in this field. If it goes on improving as hitherto, one may take for granted that operations on a really large scale will be established here. That the deposits are, on an average, of large extent I already consider as an established fact.

Whether the ore keeps towards the depth ought to be more exactly investigated at different places by means of diamond borings. The low adit mentioned above also will very much help to solve this question. But seeing that in this case on account of the quality of the ore there can only be the question of work on a large scale, a millionaire enterprise, extensive trial work must of course first be carried on. Through such trial work large quantities of ore will, as already mentioned, be taken out — an immense advantage to the company that is to carry on the work.

I have surveyed the fields 3 times, and especially watched the development at Field I, and after, these investigations and on account of the acquaintance I have thereby acquired to these deposits I can safely recommend these promising fields for *more extensive* trial operations, which I believe will lead to the establishment of continual operations on a large scale at Malsaadalen.

Christiania, 16th August 1907.

Ansgar Guldberg
of Christiania Bergbureau,
Cand. min. & Mining Engineer.

The Malsaadalen Copper Fields (Værdalen).

Christiania, 16th July 1909.

Mr. Thv. Røstad,
Wholesale Merchant,
Moss.

Dear Sir,

Having returned home from my journey of inspection to Malsaadalen I beg to inform you that I have examined your occurrences of copper up there, and inspected the work of exploration now going on, and it was on the whole satisfactorily done. They now had advanced in towards the adit (about 85 metres) as far as to obtain penetration on to the shaft (at section I) and also obtained good ventilation. The cross adits now are to be commenced in Easterly and Westerly direction, and when these are completed — direct on the dip for a length of 20 and 15 metres respectively, a very good view will be obtained of field I of the occurrences.

When this trial work, established by myself, has been executed, I shall render a more complete report in addition to the one previously made by myself. (Vide Report of 16th Aug. 1907). But already now I must add that it would be very desirable if, as soon as possible, work might be started with a larger staff of workmen of at least 50 hands, in order to arrive, as soon as possible, at a full knowledge of the whole field.

I would propose, then, to appoint a capable educated overseer, (from the Kongsberg Mining Institute), and a young Mining engineer, who were to have for his main object a very close examination of "the geology of the field". He ought to have at his disposal 10 men — and through uncovering and mining at a series of new spots in the extensive field there were the possibility of arriving at very interesting results.

I am still of opinion that the field is very promising, and that at Malsaadalen there are many and great possibilities of remunerative mining operations.

Yours truly

(sgd.) Ansgar Guldberg.

T. Ellefsøns Trykkeri, Ditlevsøet 7,
Kristiania.

Malsaadalens Kopperfelter

(Værdalen)

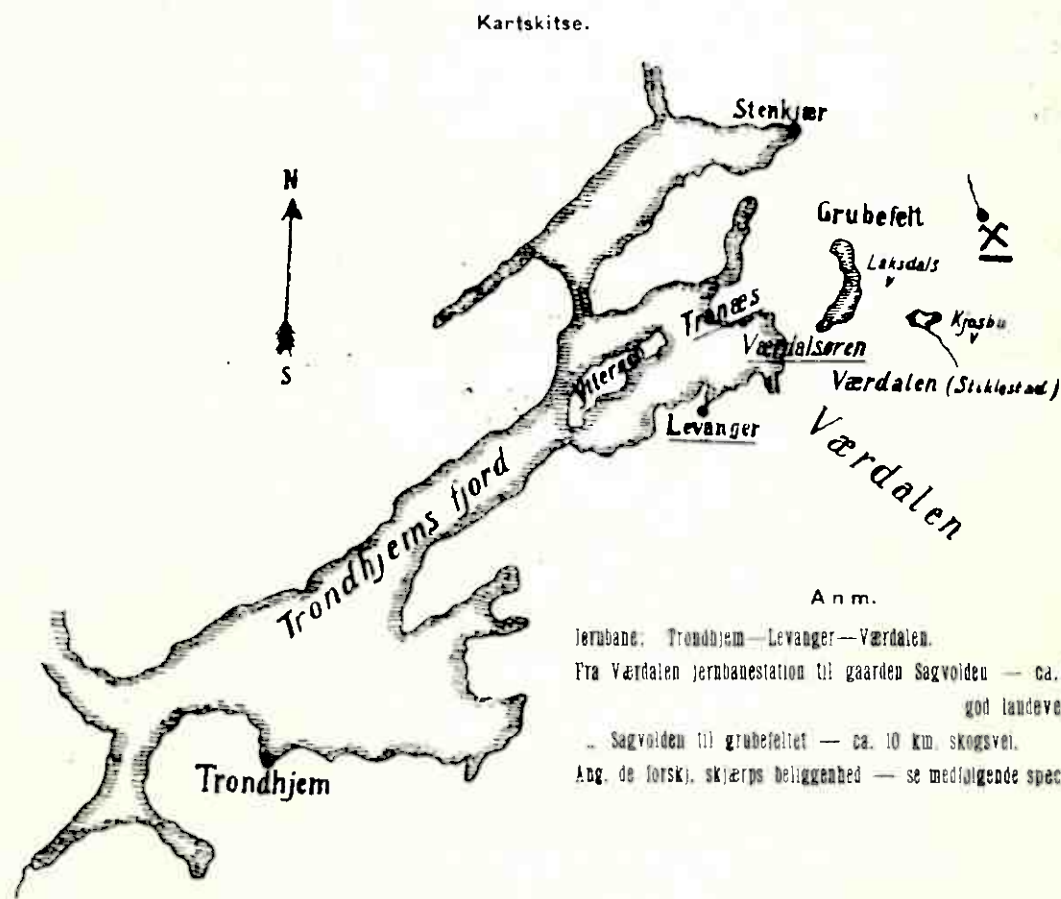
tilh. grosserer Thv. Røstad, Moss.

(Rapport af 16. august 1907 — efter sidste befaring.)

Felterne er beliggende i Vuku prestegjæld, Værdalen, ca. 40 km. fra Værdalsøen (ca. 30 km. landevei og ca. 10 km. skogsvei). —

Forøvrigt sees beliggenheden bedst af hosstaaende kartskitse og medfølgende specialkart.

Ved Værdalsøen og Trønes er isfri søhavn, og især ved sidstnævnte sted lasteplads for dybtgaaende skibe.



En „luftbane“ (taugbane) kunde maaske forkortes nogle kilometer. Men regner man 40 km. — og gaar ud ifra en aarlig transport af 100 å 200.000 tons, vil en taugbane koste ca. 700.000 kroner. Ved større transport bliver den kostbarere. Dog ved en transport af henimod $\frac{1}{2}$ mill. tons pr. aar vil antagelig en taugbane ikke længere kunne konkurrere med andre transportmidler. —

Der er ogsaa meget godt kende for anlæg af jernbane, hvortil rigelig kraft er forhaanden i de senere beskrevne vandfald. Transportspørgsmålet antages kun foreløbig og bliver senere selvfølgelig gjenstand for nærmere drøftelse. —

Malmen er kobberkis blandet med magnetkis samt svovlkis. —

Ertsen optræder i skifer, og hovedforekomsten bestaar af en bred imprægnationszone, der strækker sig nordøstlig til nordnordøstlig retning, og gjennemgaaende af meget stor mægtighed. Fald sydøstligt til østligt. — Paa flere steder forekommer ogsaa „parallelgange“ (eller „zoner“).

Kobbergehalt i de hidtil afblottede malmpartier viser sig at indeholde — i gennemsnit — 2,5 à 3 % Cu (kobber), men der findes paa enkelte steder rigere malm, helt op til ca. 10 % Cu.

Dog maa en eventuel drift baseres paa „vaskemalm“ med stordrift for øie.

Eieren, hr. grosserer Thv. Røstad, Moss, er i besiddelse af en flæde af „anvisninger“ („anmeldelser“), hvoraf 18 udmaal foreløbig blev erhvervet ved udmaalsforretning i denne maaned — paa de hidtil mest oparbejdede steder i dette vidtstrakte felt.

Felt I.

«Sagvoldhaugberget».

Dette malmfelt strækker sig fra „Sæterbækken“ ved „Malsaa gamle kobberværk“ (i NO) til „Sagdalsbækken“ ved „barakken“ (i SV). Se specialkartet! Paa denne strækning har der været arbeidet paa flere steder siden mit første besøg paa stedet (september 1906). Resultatet har hidtil været meget tilfredsstillende, idet megen malm er afblottet og lagt i dagen, og alt tyder paa tilstedeværelsen af store malmængder. Denne „ertszone“ er ved flere „afblotninger“ og „skjæringer“ forfulgt i ca. 950 m (ca. 1 kilometers) længde i strøgetningen (NO til NNØ) — og viser gjennemgaaende en stor mægtighed. Ved fjerde „skjæring“ fra „barakken“ i nordøstlig retning maalte jeg „gangens“ eller „ertszonens“ horizontale bredde til vel 13 meter — med jævnt indsprængt erts over hele bredden. Desuagtet tør man endnu ikke — paa nærværende stadium — angive det antal tons kobbermalm, som man ved eventuel drift kan gjøre regning paa at erholde pr. kubikmeter gang. Men det er — som man vil se — meget gode udsigter til at paatræffe store malmængder, og specielt paa denne strækning ser det meget lovende ud.

Der er flere større afblotninger (paa specialkartet betegnet med X) saaledes:

1) I nærheden af „barakken“ (ca. 80 m. i østlig retning):

Strøg NO. Fald østligt! Gaaet ind med en liden forsøgsskjæring og paatruffet malm — som forudseet.

2) Ca. 50 m. i strøgetningen (NO) fra 1):

Den horizontale bredde, hvor malm var indsprængt — jævnt fordelt —, maalt nu til 6,5 meter. Gjennemsniitsanalyse af ca. 100 kgr. — udtaget af underfegnede — fra flere tons udskudt malm, gav følgende resultat:

4.04 % Cu (kobber)

(Analyse fra stadschemiker Schmelck, Christiania).

3) Ca. 100 m. i strøgetningen (NO) fra 2):

Den horizontale bredde med malminprægning var her vel 6 meter.

Gjennemsniitsanalyse — taget paa samme maade som fra 2) gav 2.50 % Cu (kobber).

4) Ca. 250 m. i strøgetningen (NO) fra 3), kaldet „Pettersens skjæring“:

Den horizontale bredde med malminprægning maalt her til vel 13 meter.

Gjennemsniitsanalyse, taget paa samme maade som fra 2) og 3) — gav 0.91 % Cu (kobber). Ved denne „skjæring“ var der denne gang mere svovlkis og mindre kobberkis at se end ved

mit første besøg. Men forholdet har paa dette sted vokset nok saa stærkt, idet en gennemsnitsanalyse, taget fra samme sted, under prøvedriften i vaar, — gav 4,17 % Cu.

I denne forbindelse kan ogsaa nævnes, at en analyse fra et andet sted i samme felt, hvor der første gang var svært lidet kobberkis at se —, i vaar viste 4,71 % Cu. — Derfor har jeg ogsaa for sikkerheds skyld angivet gennemsnitsgehalten i dette felt til 2,5 à 3 % Cu.

Felt II.

„Grubestueberget“.

1) Ved „Grubestuevandets“ (Grube tj. paa kartet) sydøstre side findes 2 aflotninger, hvor der optræder kobbermalm, men her har der været arbeidet kun ganske lidt.

2) Paa nordøstsiden af ovennævnte vand er paabegyndt en undersøgelsesstoll ind i fjeldet i stregretningen, NNO. Faldet er østligt.

[Ved senere eventuel drift maa stollen anlægges længere ned mod vandet]. Her er hovedmassen svovlkis (med lidt indsprængt kobberkis og magnetkis). Det hidtil afblottede malmparti viser en fattig malm, men mægtigheden er meget stor, idet impregnationszonen her kan forfølges over 20 m. kontinuerlig i horizontal bredde, og endda er der malm i „siderne“ (mod grænserne), saa man har udsigt til en endnu større bredde, hvilket jo vil give en meget anseelig mægtighed. Det skulde ikke forundre mig om man paa dette sted fik en mægtighed af op til 10 à 50 meter, idet det efter de allerede udførte afrøskninger har vist sig at være en overmaade bred impregnationszone, man har at gøre med.

Man bør her kun regne med „vaskemalm“ ved en fremtidig drift. Foreløbig bør man koncentrere arbeidet ved felt I — hvilket jeg senere skal omtale —, og lade dette felt II foreløbig ligge som et reservefelt.

Eieren, grosserer Røstad, er som før berørt indehaver af en flæthed af „anmeldelser“ (skjærp) i samme trakter, ialt ca. 70, hvoraf de fleste endnu ikke er oparbejdet og nærmere undersøgt, og derfor ikke beskrevet her.

Ved sidste udmaalsforretning blev der ogsaa af bergmesteren givet udmaal for nogle muthinger ved „Malsaa gamle kobberværk“ (Se specialkartet) samt i „Søndtjernshalden“ („Lillevola grube“) og „Tyvdalsfjeldet“, ca 1 km. SSO for „barakken“. — Ligeledes har hr. Røstad „anvisninger“ i „Steindalsklumpen“, ca. 1½ times gang i SV fra „barakken“, hvor der forekommer en større impregnationszone med svovlkis. Støvet er ogsaa her nordøstligt med fald mod øst. Den malm, som man nu kan se i dagen (der er intet arbeidet her) er fattig, og driften kommer ogsaa her visselig til at maatte baseres paa „vaskemalm“. Dette sted er særlig skikket for grubedrift — et udmerket terrain —, hvor man meget bekvemt kunde anlægge en billig drift. Her burde man da ogsaa senere gaa i gang med forsøgsdrift, hvis der bliver anlagt endelig drift efter kobbermalm i Malsaa dalen.

Men alle disse her nævnte felter bør — foreløbig — betragtes som reservefelter, og man bør — som sagt — nu koncentrere arbeidet ved **felt I**:

Hidtil har arbeidet været drevet som et undersøgelsesarbejde i dagen for at konstatere tilstedeværelse af større malmængder, men nu ved mit sidste besøg lod jeg paabegynde en grundstoll (2 × 2,5 m.) ved „Sagdalsbakken“ (nedenfor „barakken“), i ca. 45

meters dyb under „skjæring nr. 1.“ [Dette dalføre egner sig udmerket for transporten.] Denne stoll vil blive meget oplysende, idet den bliver ført ind i stregretningen med tværsnit i passende mellemrum. Jeg agter ogsaa fra punkt (2) at drive ned en „synk“ (schakt), som kan træffe grundstollen. Dette — baade for luftvekslingens skyld og af hensyn til undersøgelsen.

Herved vil man faa malm udtaget under selve stoll-driften (og schaktdriften). Altsaa en meget heldig drift. Denne malm vil da have sin fulde værdi, naar et „vaskeri“ senere anlægges.

Al malm er derfor beordret særskilt oplagret for at man kan have et oplag færdig fra den første stund af, naar et fast „vaskeri“ bliver opsat. Der er god anledning til at erholde vasker- og driftsvand til vaskeriet lige i nærheden af de vordende gruber. Forøvrigt bør man vel ved denne slags malm bruge „Elmores oljemethode“, (og da behøves ikke saameget vand som ellers).

Med hensyn til „drivkraft“ saa disponerer hr. Røstad over 3 fossefald i disse trakter, og disse vil ved regulering kunne skaffe kraft i overflod til en eventuel stordrift.

Der er videre let adgang til at erhverve godt, stort tømmer fra statens skove lige i nærheden — til rimelige priser. Ligeledes kan man erholde beste og arbejdskraft fra selve distriktet.

Arbejdslønnen for almindelige minerere har hidtil gennemsnitlig været ca. kr. 3.00 pr. dag, men vil antagelig stige noget, hvis belægget øges, og arbejdskraft skal søges udenfor distriktet.

Konklusion:

Da der paa flere af de ovennævnte steder findes ganske pen kobbermalm, og da man ogsaa paa mange andre steder i dette store felt kan se malm i dagen, — og endelig da feltet er vidtstrakt, saa er der mange muligheder for fremtidig stordrift. Og da der specielt ved felt 1 allerede er blotlagt store drivværdige malmpartier, saa maa man kunne sætte store forhaabninger til dette felt!

Hvis det fortsætter at bedre sig — som hidtil, tør man gaa ud fra, at det her vil blive en virkelig stordrift. At forekomsten har en gennemgaaende stor mægtighed betragter sig som allerede konstateret. Om malmen holder sig mod dybet, bør man nærmere undersøge paa forskellige steder med diamantbøringer.

Den ovenfor nævnte „grundstoll“ vil ogsaa i høj grad bidrage til at løse dette spørgsmaal. Men da det her — paa grund af malmens beskaffenhed — kun vil blive tale om en stordrift, et millionforetagende, maa man selvfølgelig først drive en omfattende forsøgsdrift. Under en saadan drift vil man — som allerede omtalt — kunne faa store mængder malm udtaget —, en umaadelig fordel for det selskab, som kommer til at drive.

Jeg har 3 gange befaret felterne og specielt fulgt hele udviklingen ved felt 1, og efter disse undersøgelser og det kjendskab, jeg derved har faaet til disse forekomster, kan jeg trygt anbefale disse lovende felter til en **større** prøvedrift, som jeg tror vil lede til anlæg af en fast stordrift i Malsaadalen.

Christiania den 16. august 1907.

Ansgar Guldberg.
Christiania Bergbureau,
Cand. mineral., bergingeniør.

Malsaadalens Kobberfelter

(Værdalen)

Christiania 16—7—09.

Herr grosserer Thv. Røstad,
Moss.

Hjemkommet fra min inspektionsreise til Malsaadalen skal jeg meddele, at jeg har befaret Deres kobberforekomster deroppe og inspiceret det paa gaaende undersøgelsesarbeide, hvilket i det store heletaget hidtil var tilfredsstillende udført. — Man havde nu naaet ind mod stollen (ca. 85 m.) saalangt at man havde faaet gennemslag til schachten (ved skjæring I) og faaet god luftveksling. — Tverslagene skal nu paabegyndes i østlig og vestlig retning, og naar disse er fuldført — ret mod faldet — i resp. 20 og 15 m.s længde, saa vil man faa en meget god oversigt over forekomstens felt I.

Naar disse af mig igangsatte forsøgsarbeider er udført, skal jeg give en udførligere tilhægsrapport til min tidligere. (Se rapport af 16—8—07). Men allerede nu maa jeg tilføie, at det vilde være meget ønskeligt, om der snarest mulig kunde gaaes igang med en større arbejdsstok paa mindst 50 mand — for snarest mulig at komme til fuldt kjendskab om det hele felt.

Jeg vil da foreslaa ansat en flink, uddannet stiger (fra Kongsberg bergskole) samt en yngre bergingeniør, der særlig skulde faa til opgave at studere „feltets geologi“ meget nøie. Til hans raadighed skulde staa 10 mand — og ved afdækning og minering paa en række nye steder i det store felt vilde man kunne komme til meget interessante resultater. —

Jeg er frendeles af den mening, at feltet er meget lovende, og at der findes mange og store muligheder i Malsaadalen for en lønnende drift. —

Ærbødigst

Ansgar Guldberg (sign.)

OVERRETSSAKFØRER

H. C. WØLNER

KIRKEGATEN 17 III

TELEFON 11660

Kristiania, 1 April 1910.

1/2

Disponent Maartmann,

Ringnes Bryggeri.

J h. t. aftale tillader jeg mig
at oversende vedlagt:

1. Reports of 11th Oct. 1906 and 16th Aug
1907 &c by Mr. August Guldberg

2. Udtalelse vedr. Malsandaleens politier-
meluførerekonster (Vardalen) af 25-7-1909 af
prof. Johan H. L. Vogt.

Respektfuldt
H. C. Wølner.

Ovennævnte for Dr. J. H. Smith.

H. L. S.

Stolt
1914
Promemoria.

ELEKTROKEMISK
SKOROVAS GRUBER

Norges Geologiske Undersøkelse

Bergarkiv:

Rapport nr.: 2600

MALSAADALENS KOBBERFELTER. 1914

P4-11-56

Om dette felt foreligger der 4 rapporter samt
utskrift av Bergmesterens befaringsprotokol, rapporterne er skrevne
av de herrer Guldberg, Vogt, Rasmussen og Christiansen. Rapporternes
indhold stemmer ikke synderlig godt overens.

Feltets beliggenhet maa ansees som ugunstig-
40 km. fra havn. Saavel Guldberg som Vogt nævner anlæg av taughane,
som av begge anslaaes at koste ca. 700.000 kr. Guldberg forutsætter
en aarlig transport av 100.000 til 200.000 t., mens Vogt vil smelte
saavel skeidemalmen som sligen fra opberedningen paa stedet.

At Guldbergs produktion er altfor høit anslaat
kan der vel neppe være tvil om; paa den anden side er vel ogsaa, hvis
malmen smeltes eller godgjøres paa and n maate paa stedet, en taug-
bane overflødig.

Det fremgaar av samtlige rapporter, at raamal-
men inwertfaad maa opberedes. Angaaende sammensætningen av raagodset
og skeide-malmen eller konsentrat er ogsaa opfatningerne forskjel-
lige. Saaledes angir Guldberg endel gjennemsnitsanalyser av raagodset.

Prøverne, som delvis er tatt av ham selv dels av an-
dre viser. :

4,0,4% Kobber

2,50 " "

0,91 " ")

4,17 " ")

paa samme sted men til forskjellig tid

4,71 " "

Som gjennemsnit for feltet angir han 2,5 - 3 %
kobber. Vogt inålater sig ikke paa spørsmålet, da de av ham
uttatte prøver, da han skrev rapporten, endnu ikke var analysert.
Naar han imidlertid överst paa side 13 angir "Hvis opberednings-
godset holder gjennemsnittlig 2 % kobber", saa viser dette, at
han ikke anslaar det gjennemsnittlige kobberindhold i raagodset

til mere end 1,5 - 1,7 %. For et Elmorekonsentrat (slig) angir han paa side 12 10 % kobber, men reduserer dette paa side 13 til 8 %.

Christiansen gaar paa side 24 ut fra, at raagodset holder 1,5 % kobber og at det kan skeides i like dele skeldemalm og graaberg med henholdsvis 25 % og 0,5 % kobber. Paa side 18 derimot sier han, ^{at man kan paaregne} en skeide-malm med $3\frac{1}{2}$ - 4 % kobber og et affald som holder 0,5 % "

Kvantitetsberegningerne stemmer bra overens i de forskjellige rapporter, der opgis saavel av Vogt som av Christiansen de samme tal, og Rasmussen slutter sig til Vogt. Litt vildledende er det, at Vogt taler om "opberedningsmalm" istedetfor raamalm, hans tal $\frac{1}{2}$ mill. tons opberedningsmalm tilsvare Christiansens 900.000 t. raamalm.

Den eneste som indlater sig paa en rentabilitetsberegning er Christiansen, og denne baserer han paa Hybinettes process. Kraft vil han ta fra Granfossen, som kan levere 1800 HK. Utbygningen av denne setter han til kr. 99.600 - fuldt utbygget. Dette gir kun ca. kr. 55 pr. HK. og er et rent fantasital. I almindelighet regner man fra 150 - 250 kr. - avhengig av de lokale forhold. Riktig nok vil han kun utbygge 740 HK og setter da op kr. 70.000 for utbygningen, dette tal er ogsaa altfor lavt.

Til et veianlag opgir han paa side 20 8.- kr. pr. løpende m., men i sit omkostningsoverslag paa side 23 opgis 3.- kr. Det er sandsynligvis en skrivfeil, at der først opgis kr. 8.-, men dette tal vil sikkerlig stemme mere overens med virkelige forhold for en 3,6 m. bred grusvei over myrlendt terrang. Som man av dette vil se, hersker der uoverensstemmelser saavel inden de enkelte rapporter som mellem rapporterne indbyrdes, og særlig synes mig Christiansens rapport - spesielt hvad k omkostningsoverslaget angaar - at være noksaa løst

opsat og indeholder som påvist absolutte feilantagelser.

Til trods herfor gir rapporterne et gjennomgaaende godt indtryk, og vil jeg tilraade at feltet underkastes befarings til sommeren.

F. Hannestad

6 - 2 - 1914

Akti

H. H. Smith

PRO MEMORIA ANG. MALSAADALEN

Undertegnede, ingeniør Nannestad, befor dette felt den 9/juni-d.a., og uttalte sig om forekomsten i skrivelse til E.K. av 11te s.m.

I denne skrivelse konkluderer jeg med at si:

- " Paa grund av den ugunstige beliggenhet, det lave kobber-
- " indhold i raagodsset og den vanskelige opberedning, anser
- " jeg ikke feltet for at være drivverdig."

Jeg mener derfor at feltet bør avslåes ; men forinden definitiv besked gis Hr. grosserer Røstad, bør vi av ham utbe os analysen fra den av dr. Vogt uttatte gjennomsnittsprøve.

F. Nannestad

24-6-1914

H. H. Smith 1914

ELEKTROKEMISK
SKOROVAS GRUBER

Norges Geologiske Undersø

Bergarkiv

Rapport nr.: 2885

P4-11-57

Til

Det Norske A/S for Elektrokemisk Industri,

H e r s t e d s.

MALSAADALENS KOBBERFELT.

Jeg har gennemgået rapporter fra Herrerne Guldberg, Vogt, Rasmussen, Christiansen og gennemlæst bergmesterprotokoller, og har herigjennem fået den opfatning, at Malsaadalen ikke frembyr noget av interesse for Elektrokemisk for nærværende. Der er liten overensstemmelse mellem de forskjellige forfatteres opfatning av feltet, og dette har vor Ingeniør Nannestad specielt fremhævet i sin kritik, som er meget klar og taler et tydelig sprog.

Ved Herr Thv. Røstads besøk meddelte denne bl.a. :

Malsaadalen har været haandgit Professor Hjalmar Sjøgren 1908, men affæren strandet, da optionstiden, 6 måneder, var for kort.

Da Sjøgren ansøgte om en forlængelsestid paa yderligere 4 måneder, blev dette avslået, hvorfor han maatte la saken gaa fra sig.

Siden har feltet været tilbudt i Berlin, til von Lippman, og hans egen ingeniør har været oppe ved feltet. Dennes rapport foreligger ikke.

Samtidig med Guldberg har Direktør Normann besøkt feltet, dog kun ved første befaringer.

Admiral Børresen hadde ogsaa gruben en tid med tanke paa Hybinette processen, men da denne ikke lykkedes, opgaves feltet.

Desforuten har Røstad havt feltet frembudt i Berlin gennem Mohr i Bergen, og ogsaa i London og Paris. Selv meddeler han, at han altid har været aarsak til, at det aldrig er kommet til forretning, fordi optionstiden har været for kort, og priser og andre vilkaar for strenge. Nu, efter lange aars bitter erfaring vil han skille sig av med feltet paa vilkaar, som han selv finder anta lige.

Feltet overlates for maximum Kr. 75 000.-, hvori indgaar alle gruberettigheter og alle vandfald; dette beløp utgjør omtrent alle utlæg, som Røstad har havt i disse aar. Hertil kommer yderligere Kr. 55 000.- som utgjør Røstads forpligtelse overfor oprindelige eiere av forekomsten, - eller tilsammen et beløp av Kr. 130 000.- For dette beløp er Røstad villig til at avstaa feltet, men samtidig betinger han sig en andel i fortjenesten, om Elektrokemisk selger feltet eller danner selskap. Rækkevidden og omfanget av senere vilkaar og forhold ønsker han, at Elektrokemisk skal angi; likeledes overlater han til Elektrokemisk at bestemme optionstidens længde. Dette er jo meget forekommende, men det bortfalder dog, hvis vi ikke kan antage de øvrige vilkaar, prisen, Kr. 130 000.- er jo allerede altfor høi.

Saadan som saken nu staar og i betragtning av vore andre forpligtelser, ser jeg ikke, hvorledes det ørede Selskap yderligere skal kunne paata sig denne affære. Min mening er, at exploiteringen av denne affære hverken blir let, billig eller gjort paa kort tid, thi det beror paa hvilket produkt - kis eller kobbermalm - erholdes og hvorledes dette skal utvindes, ad mekanisk eller metallurgisk vei.

Det kunde være noget at tænke paa og om mulig foreta en befaring til sommeren, men uten nogen forpligtelse fra vor side.

Kristiania, den 25 Februar 1914.

K r b ø d i g s t,

H. H. Smith.

170-1-512

ELEKTROKEMISK 1/3
SKOROVAS GRUBER

1090

P4-11-55

MAISÅDALENS COPPER ORE DEP.

Ansgar Guldberg, 1907, J.H.L. Vogt, 1909,
W-C. J. Rasmussen 1910, Alex Christiansen 1912,
J. Winsnes 1870, Per Mortensen 1912.

side 17, 18, 19, 20 og 27 til og med 35.

Geology.

The geology of the deposit is very similar to the other large iron- pyrites deposits near Trondhjem. The rock is the same highly pressed slate, which may be retraced in the district towards Røraas, and where Meraker, Kjølli and Killingdøl mines are located. As is the case by them we can also here trace large bodies of gabbro close by. Special for the deposit at Sagvoldhaug is a large massiv of quartz, which occurs next to the hanging wall and follows the direction of the bearing over a distance of fully 1 km.

The main bearing is N N E with a flat dip of 15° - 30° to S S E. The stratification is quite uniform.

According to the minerals, which occur, the deposits in Valsaadalen may be divided in : -

Sagvolden and
Vetringshella (Grubetjern),
which principally contain copper- pyrites and magnetic- pyrites and
Lillevola and
Tyvedalshella,
which contain iron- pyrites.

On my inspection I have only visited the former, as they alone have been worked to any extent and may be of interest to possible extraction works.

In the following a short description of each deposit will be given :

Sagvoldhaugen.

Next to the foot- wall of the above mentioned massiv of quartz occurs a belt of impregnation carrying copper- pyrites, magnetic- pyrites and iron- pyrites in slate. The ground along the deposit is marshy and rock is occasionally seen on the surface.

The minerals occur as a rule evenly distributed over the ore- belt but do in some places concentrate to compact orebodies, as of copper- pyrites at claim no. VIII

18
and of iron- pyrites at claim no. IX (see attached sketch of exploration work done)

The exploration work done so far is principally confined to "Sagvoldbakken", where a 84 m. long adit has been driven and in connection with same a 28 m. deep shaft has been sunk. Otherwise only cuttings and small workings have been carried out at this deposit. The existence of the ore- belt is thereby proved, but no reliable information as to the thickness and the ore in same has been obtained.

Through the exploration work done I consider it proved, that the impregnation- belt extends from Sagvoldbakken to the plateau south of the old Malsaa- Copper- works, a distance of fully 1 km. It is, however, not proved, that it continues as far as Grubetjern, which is located in the direction of the bearing, as here on a distance of several hundred meters only one prospect hole has been made. For this reason I consider the deposit at Vetringshalla (Grubetjern) as a separat one.

The difference in altitude between the highest point, claim x, and the level of the adit is ab. 50 m. and therefore it is quite certain, that the deposit extends 100 m. along the dip. But the considerable length of the deposit makes it probable, that the ore- belt has a greater extension in depth. The thickness of the ore- belt measures in the shaft ab. 12 m., of which the above lying 4 m. is copper- pyrites, (sample no. 2) and the rest iron- pyrites. In the adit, 25 m. from the entrance, the ore- belt has the same thickness, but the ore here is a mixture of copper-, magnetic-, and iron- pyrites (sample no. 1.) In the east crosscut, furthest in, the ore- belt is also reached. In the open cuttings on the surface it is hard to define the thickness of the ore- belt, but the part carrying copper- pyrites is also here several meter wide and shows in some places as by claim no. VIII very good ore (sample no. 3.)

At the present state of the exploration work nothing definite can be said as to the occurrence of the ore. From the many surface works it seems as if the copper- pyrites carrying parts may

be expected in quite different beds of the ore-belt and one has consequently to be prepared also for parts with no ore. For this reason I have taken no average samples, as I consider same insufficient for basing a calculation of the quality of ore on.

As to the sorting of the ore experience from similar deposits show, that a picked ore of $3\frac{1}{2}$ - 4 % Cu and a gangue containing 1 % Cu may be expected.

My view of the deposit at Sagvoldhaug is:

That the exploration work done proves the presence of payable ore over a vast and regular area, but no calculation of the quality and quantity of ore in sight can be based on same;

that the deposit is promising and encouraging for regular development work, which should be carried out by adits transverse to the direction of the bearing and connected with surface works between same. The cost of this development work is estimated at Kr. 100 000.-

The erection of extraction works should of course be postponed until the development work has made certain, that the deposit really contains, what it at present seems to promise. The ore mined during the development work should be skorted and stored.

The estimated cost for the erection of extraction works and the working expenses for same, which are given below, are only based on my impression of the deposit.

Vetringshalla (Grubetjern.)

The deposit consists of 4 claims, which are located round the lake "Grubetjern". Through small cuttings the same gangue (slate) and the same minerals (copper-, magnetic-, and iron- pyrites) as by Sagvoldhaugen have been proved. But the workings do not make the impression of belonging to the same deposit and I consider them to be separate bodies of ore.

On the north side of the lake at claim no. IV a 4 m. wide impregnation of the iron- pyrites occurs, the

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continuation of which towards east is a complex- ore with some galena.

On the south side of the claims I and II the principal ore is copper- pyrites. The workings here showed very rich ore.

Compared with Sagvoldhaugen this deposit is of little importance and the further exploration of same should be postponed till later.

The extraction of the ore.

The most important items in connection with the use of the Hybinette- proces, are: -

- 1.) That the copper in the residue can be reduced to a minimum;
- 2.) That the quantities of transport are small;
- 3.) That electric power is at hand;
- 4.) That the output is not too small, as the cost of the extraction per ton copper decreases with increased output.

ad 1.) The treatment of the ore.

After the experiments carried out in Kristiansand with a large sample of ore from Malsaadalen, does the ore not contain any mischievous components, and the copper in the residue was reduced to a minimum.

ad 2.) Transport.

In order to get connection by road with the nearest railway- station, Vardalsgren, and the port, Tromsø, is it necessary to build 14 km. of road from the farm Volden in Vuksa to the deposit in Malsaadalen. The ground is principally marsh and easy grades are obtainable. The cost of building a 3,5 m. wide road covered with gravel is estimated at Kr. 3,00 pr. m. - - The distances are :

Sagvoldhaugen - Vardalsgren 40 km.

Copies of the reports by the chief Mining Inspectors in Trondhjem on the Copper- deposits in Malsaa Commonage.

I.

In the autumn 1865 a considerable amount of prospecting took place in Verdaalen. By almost every post a parcel of claims arrived for registration, of which some were sold to merchants in Trondhjem. From the month of August the latter have carried on extensive exploration work with up to 30 men. The claims are divided in the western and the eastern after the locality. As regards the occurrence they are both alike, the ore appears partly bedded in a soft shist, partly impregnated.

In the western claims were mined ab. 80 - 100 cub. m. in three places.

In no. 1. which is located in the sump, the ore was finely impregnated in the shist. Here was mined 3,75 and 11,3 m., principally as sidestoping. In no 2 and no. 3, which were located on the same lode 67 - 80 cub. m. was mined as footstopping on the surface. Here the ore is more compact and partly accompanied by some iron- pyrites. No sorting was done so far, only the ore- carrying material was separated from the gangue. In the former some very nice lumps of ore were seen, and I estimated, that these workings would give 2,4 - 2,9 tons of 5 % ore per 6,7 cub. m. The place should therefore be closer investigated.

The eastern claims are also 3 in numbers, of which no. 1. contained iron- pyrites mixed with quartz and partly magnetic- pyrites, for which reason I cannot recommend same to further investigation.

No. 2 was worked as side- stoping and showed a very nice opening, which certainly would give 3,2 tons of 5 to 5½ % ore per 3,5 sq. m.

No. 3 is located on a small rock in a large sump. It was of small thickness and appeared to fall to all sides, a cloak- shaped bed seemed to be present. I am told about numerous claims in this commonage and in the estate of

consul N. Jensen, but as the ground was allready covered by heavy snow and no work was here carried on, I did not inspect same.

All these claims are located not far from the discontinued Mok & Oulstad mines. If the work is carried out with skill and economy there would be no risk and it is possible that a paying but small concern may be established. As the deposit is located ab. 40 km. from the sea, the transport of the ore, if sent to England, will be expensive.

II.

1866. The deposits in Malsaa belong to two companies, "Malsaa Grubekompani" and "Malsaa Minekompani", both of which having secured several claims, but work is only carried on in two places and on a small scale. From an inspection last year of some of these claims I found that in a few instances an exploration was justified, but no excellent results could be expected, as the ore- copper pyrites- did not occur as a regular shaped lode, but more or less as an impregnation in the shists mixed with some magnetic pyrites and iron pyrites. The workings carried out later are not very promising, and the quantity of ore obtained is very small in proportion to the quantity of rock mined.

The "Minekompani" has sunk a shaft 8 - 10 m. deep on the most promising claim and the ore has been very irregular. The shaft did not look promising at any visit, but on the dumps good ore was seen.

The "Grubekompani" has been working two stopes in northern direction and at the head of same sunk two small shafts, where the ore is said to decrease. The company was at present sinking a shaft, carrying impregnated ore. The ore-deposits in this district are numerous, but the quality of the ore is very poor.

Some of the mines belonging to these companies are old and did formerly belong to the discontinued Mok works. Among these is the mine "Vetringshalden", where fine iron- pyrites was seen on the dumps. This mine is now full of water. In the opening ab. 2 ft. of fine iron- pyrites was seen. But in order to ship iron- pyrites from here, the thickness has

to be considerable and the ore quite pure, as the costs of transport are heavy. The management at these mines consists of a farmer teacher and a farmer.

III.

Report by J. Winsnes, dated Oct. 18. 1870 :

The rock consists of a chloritic shist with bearing S - N and dip ab. 20 deg. to E. Copper- pyrites and iron- pyrites mixed with some magnetic- pyrites occur in layers in the shist. The lowest bed - Nyskjærpet - was uncovered in most places on the surface for a length of 25 m. and was rather mixed with quartz. The impregnation of ore was so poor, that the outcrop did not invite to further exploration.

Above the bed called "Nyskjærpet" was another bed of ore in a soft, broken- up chloritic shist, from where a shaft- Haugen mine - was sunk to a depth of 12 m. and continued in the direction of the bearing for 7 m. The ore was principally pure copper- pyrites, of a rich impregnation over a thickness of 1/1 3m., but it did not continue more than ab. 4 m. along the bearing. This mine was connected with an extensive working further south and in the hanging wall with a bed of poor impregnation of iron- pyrites. More than 70 m. N E for this mine was another working - Storgruben - 22 m. long, in a soft chloritic shist. The first 9 m. had a thickness of 9 m. along the bearing, the other 13 m. was a level. The last 2 m. of the level had gone through rock, so probably the ore- carrying bed has been intersected.

The level was not accessible, but in the roof ore was seen in the hanging wall. In the first large stope, the ore had occurred in 2 layers and had been rich in some places but appeared now rather poor. At the opening a shaft was sunk to a depth of 12 m., but no ore was met with, although the bed at Haugen mine should have been intersected, , if it had continued in bearing so far north. The bed at Nyskjærpet is traced on the surface ab. 20 m. south, and notwithstanding that no clean working was seen, I got the impression, that this also

was rather poor.

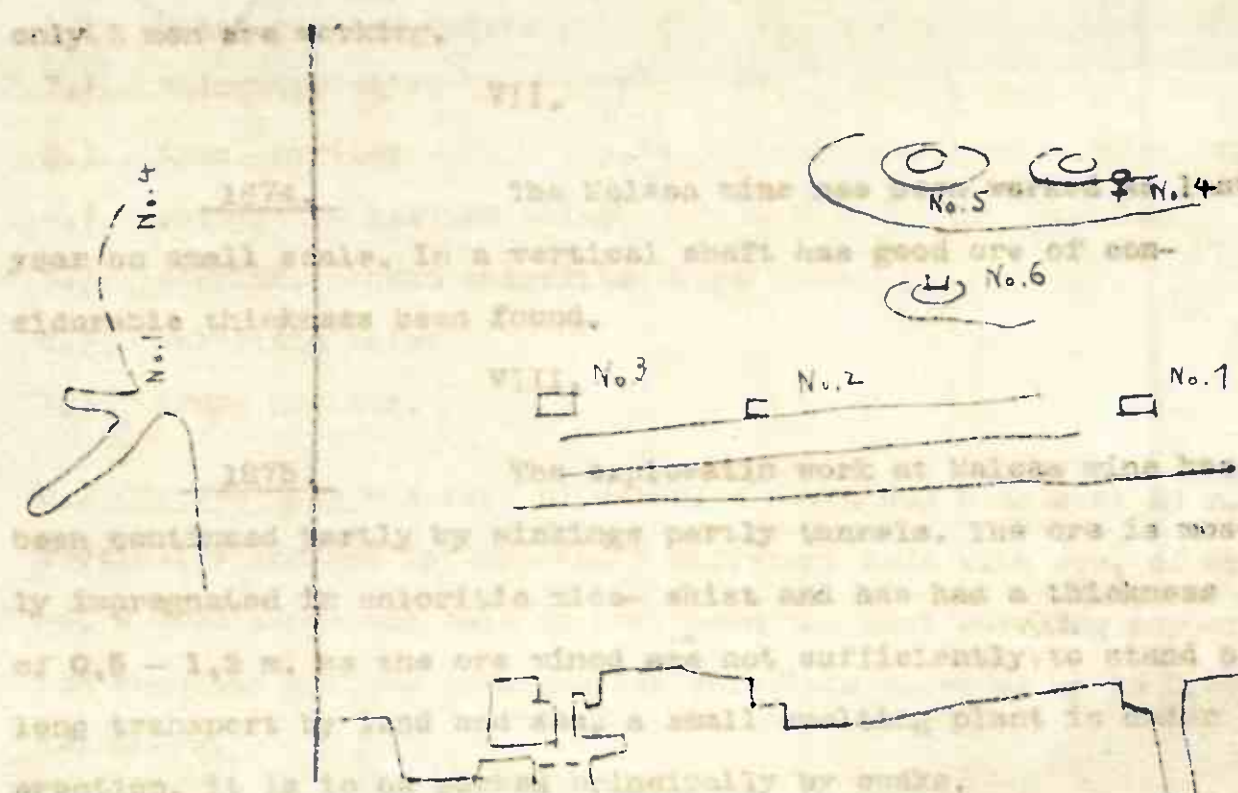
As the ore- deposit appears to be divided on several beds and in each bed of any quantity only in shorter lengths of the bearing, there is, with the present low prices on copper, no reason to continue the exploration work. It would be different, if copper again fetched the high price, which it had a few years ago. In many places close by the claims there are good facilities for the erection of smelting works and charcoals for works on a small scale may be had cheaply from the commonage of the state and that of Verdalen. It would be difficult to melt the ore alone, but iron- pyrites for a suitable charge may be taken from the iron- pyrites deposits in the neighbourhood.

IV.

1871. Malsaa mine has been worked on a small scale for years. The work has on the whole to be considered as an exploration, from the workings carried out partly on the surface partly below same.

Any idea as to the possibility of making the working of the deposit profitable has not been obtained; no sorting of the ore has been done except for a small parcel sent to England. The bulk of raw ore is lying in the mine which is a pity, as the raw ore or the part of same lying on the top seems to be very fair. The oldest working is full of water.

The western deposit was in a depth of 15 - 17 m. along the dip connected with the surface through an adit. The shaft was full of water. It was said that there was still ore here. A plan of the workings is shown below : -



Report on inspection by Blomqvist in August 1872.

The Malsaa mine is principally worked as exploration since last year a shaft has been sunk. The deposit has a considerable thickness but the ore is disseminated throughout same and only a small portion is obtained as lump or by sorting. But the impregnated ore consists largely of pure copper-pyrites. As the erection of smelting works have not yet been decided on, is a fair quantity of ore laid upon, the dumps out otherwise.

1872. Malsaa mine is principally worked as exploration since last year a shaft has been sunk. The deposit has a considerable thickness but the ore is disseminated throughout same and only a small portion is obtained as lump or by sorting. But the impregnated ore consists largely of pure copper-pyrites. As the erection of smelting works have not yet been decided on, is a fair quantity of ore laid upon, the dumps out otherwise.

In my opinion 6,7 cub. meter of the lode will give :

1,44 tons of 5 - 6 % ore with 80 kg. Cu	
2,56 " 3 - 4 " " " 90 " "	
3,20 " 1,5 % 3 " " " 74 " "	24 kg.
<u>7,20</u>	

At a high estimate the mining expensis pr. 6,7 cub. m. should not exceed 70,0 k.

The smelting of 7,2 tons of ore on the spot 70,0 "

the expensis of mining and smelting 140.— "

VI.

1873. Malsaa mine has not been inspected

only 2 men are working.

VII.

1874.

The Malsaa mine has been worked as last year on small scale. In a vertical shaft has good ore of considerable thickness been found.

VIII.

1875.

The exploratin work at Malsaa mine has been continued partly by sinkings partly tunnels. The ore is mostly impregnated in chloritic mica- shist and has had a thickness of 0,5 - 1,2 m. as the ore mined ^{is} ~~was~~ not sufficiently ^{rich} to stand a long transport by land and sea, a small smelting plant is under erection. it is to be worked principally by coaks.

Report on inspection by Winsnes in August 1875.

a.) A small shaft had been sunk along the dip of the deposit ab. 40 m. down from a winch, driven by horse-power and standing a few yards below the opening. The ore carrying bed had a thickness of 1,2 m. and showed a rich impregnation of copper- and magnetic pyrites. 20 m. from the sump a tunnel had been driven south for a distance of ab. 1,6 m. and had shown impregnated ore of a thickness from 0,3 - 0,6 m. 5 m. above the last tunnel another tunnel had been driven for a few yards on a layer of chloritic shist carrying ore over a width of 1 foot. about 16 m. south another tunnel ^{has been started to meet the workings} mentioned in order to improve the air.

At the bottom of the shaft the ore carrying bed measured 0,3 - 0,6 m. Ab 6 m. south - west from the mouth of the adit another shaft has been sunk from the surface and 7 m. down. In this shaft the chloritic has been highly impregnated with copper and magnetic pyrites over a thickness of 1,3 m. Besides the beds carrying copper- ore are in the Archibald mine also found layers of iron- pyrites - varying in thickness - both in the hanging wall and the foot wall.

A cross- section on the dip would show downwards : -

It may be questioned if it had not been more practical to build the smelting plant in the valley, where there is ample supply of water. But the transport of ore down

- 1.) Shist with on quartz
- 2.) chloritic shist
- 3.) iron- pyrites
- 4.) chloritic- pyrites shist
- 5.) clayish, broken chloritic shist
- 6.) chloritic shist
- 7.) iron- pyrites.

b.) Croves mine was full of water. A shaft had been sunk 24 m. vertically and had intersected 5 different beds with ore, of which no. 4 from above was said to have been the best carrying copper- and magnetic pyrites in a quartz chloritic shist of up to 0.65 m. thickness.

c.) Fletschers mine is an open cut on a lower lying quartz layer of chloritic shist than the one in Archibald mine and is perhaps the same bed as no. 4 in Croves mine. Copper- and magnetic- pyrites as impregnation was seen, but of no high quality.

Some yards further on did also a lower lying bed occur - perhaps no. 5 in Croves mine - and another still lower near the smelting plant, but neither of the two had been worked.

An adit had been started near the smelting plant. This would be ab. 240 m. long and strike the deposit ab. 50 m. below the surface at Croves mine and intersect all the ore- carrying beds.

From the exploration work done on the deposit at Malsaa it appears in my opinion doubtful, if a profitable concern can be established there. And I consider it premature at present to start building on expensive smelting plant. The furnace will be of the same size as the one at Grinellid and is to burn coaks. Where the smelting plant has been started there is hardly water all the year round, but if the smelting should increase, so the time when the water was plenty would not suffice, it was the idea to work the blower with a steam engine.

It may be a question if it had not been more practical to build the smelting plant in the valley, where there is a supply of water. But the transport of ore down

would probably be more expensive than the transport of coaks up, and as it is of great advantage to have the work concentrated in one place, I believe the smelting plant is on the right spot. Ab. 225 tons of 4 - 5 % ore ^{stock for smelting, but no information} is ~~in~~ ^{could be got} ~~into~~ the quantity of ore obtained from the rock mined.

I .

1876.

The Malsaa mine is now near 40 m. below the adit. The upper part of the main shaft was neither rich nor poor, the copper- pyrites with iron- pyrites being highly impregnated in the shist.

Further down the ore is decreasing to both sides, so the mine is looking very bad at present. It was arranged for smelting the ore from this mine on the spot, as it would not stand the long transport over land. For this reason a smelting plant has been erected and some coaks taken up, but I don't know if any smelting has taken place this autumn.

I.

1877.

The Malsaa mine has been worked very little since last year. Some minor claims have, however, been explored on the surface, but they have proved unregular and are sure not to be of any size. At present they are smelting the ore previously mined.

xi.

1881.

The Malsaa works were inspected on the 15th of March by the chief mining inspector and his assistant.

Only the mining captain and one miner have been working for a few days every month in order to keep up the mining rights. It was mentioned that the works would be closed and they only waited on the final decision of the board of directors.

Archibald mine, which is 100 m. deep, was full of water up to 50 m. The conditions are in the same in the lower part as above. Copper- and iron pyrites occur impreg-

dated in an intersected layer of chloritic shist. The extent in bearing is only a few yards and less than in the upper part of the mine.

Coves mine was not accessible.

If further exploration should be done at Malsaa, the mining captain recommended this to be carried out in the cutting at Coves mine.

From the explorations already done and with the present low prices on copper it seems however, to be of very little interest to continue the further exploration in a place, where the transport of fuel and other materials is so long and expensive. It is to be regretted, that so much money has already been wasted on exploration work.

xII.

1884. On account of the present prices on copper, the work has practically been stopped. The expenses are given as Kr. 571,20.

xIII.

In the yearly reports of 1876^{and 1877} by the chief mining inspector are the following figures relating to Malsaa works given :

Year	Mining		Smelting				
	Rock mined in cub. m.	Ore in tons	Copper in the ore tons	Number of men	Smelted ore in tons	Copper produced in tons	Number of men
1876	2430	448	17,9	60	140	-	-
1877	240	46	2,3	6	535	5,3	12

The working expenses for 1876 are: Kr. 14 000.--
and " 1877 " : " 22 536,12

The mining head-office at Trondhjem Oct. 4. 1912.

(signed) Per Mortensen .