

R E P O R T

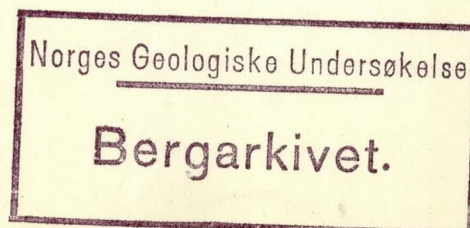
On

THE SKRATAAS ZINC & LEAD MINES
IN NORWAY.

by

R. Støren, mining engineer.

1928.



INDEX.

	Page.		Page.
Annual production of ore	17,20	Materials	21,26
" of concentrates	26	Metallurgical processes	5,12
sinking of the mine	21	Net benefit	26
" of capital invested	26	Number of hands	25
working expences	26	Operation, regular	20
Assays of Skrataas ore	9,10	Ore in-sight	15
" Marken "	11	Ore-quality	11
" Indbryn "	11	Ore-quantity, Skrataas	15
" concentrates	12,13	Outsiders	17
Benefit	26	Packing, costs	25
Bjønnsaas mine	1,16,17	Possible ore quantity, Skrataas	15
Buildings	23	Plant construction	22,23
Callows pneumatic. flotation	5,13	Probable ore quantity	15
Capital hitherto invested	5,20	Proprietors, older, present	3,4,9
necessary for new		Quality of the ore	9,11
development	18	Quantity " " "	15
" for operation	20,26	Quotations	14
" constructions	17,20,24	Re-imburse of capital	20
Climate	1	Register of self-cost, of the	22
Cobbed ore	14	sale product	26
Cobbing	22	cost of constructions	24
Communications	1	development work	19
Complexe ore	3	Electric power	25
Concentrates, and value of	12,13,14	labourers &c.	25
Concession	9	Regular operation	20,26
Constructions, and cost of	18,20,24	Researching work	18
Cost of operation	20,26	Reserves	16
Crushing station	22	Roktdal claims	8,17
Cubic meters production	11	Second sort ore	10
Deposits, zinc ore	6	Silver	9,10
Development work, older	3,4,11	Sinking, annual of capital	20,26
new	18	Skrataas	1,3,6,
Dip	6	Smalls	10
Dressing, -plant	12,22	Situation	1
Duration of time of Construc-		Stratification	6
tion	24	Summary	27
new development	18	Tailings	12,13,23
the ore quantity	16	Taxes	9,26
Electric power, price of	21,25	Testings	4,5,12,13
Experts	3,4	Tons ore per cub. mtr.	15
Flotation, Callows	5,13	Trading capital	20,26
older processes	5,12	Value of Cobbed ore	14
Freight	2,25	" concentrates	14
Geologically	6	Wages	2,15
Gold assays	10	Waste rock	11,22,23
Hand-picked ore	11	Watering	23
Historically	3	Working expenses	26
Indbryn claim, assays	1,8,16	Zinc ore deposits	6
Investment of capital	5,17	" concentrates	12,13
Joint-stock capital	5,20		
company	20		
Labour conditions	2		
Lead, assays	9,10		
concentrates	14		
ore dressing	12,13		
Maps	34		
Marken mine	1,8,11,16		

THE SKRATAAS ZINC & LEAD MINES

in Norway.

Situation.

The Skrataas zinc and lead deposit is situated in Egge parish in Nord-Trøndelag county. It stretches from the Svennung farms from west about 3 engl. miles to the east along the woody hills towards Sunnan on the Snassen lake. Several prospects are to be seen, although the greater part of the ground is lying covered.

The main mine, Skrataas, claimed in 1885, is situated on the northside of the Stammyr lakelet in the hills of Skrataas farm and 700 feet over the sea level. Down to Sunnan railwaystation, which is distanced abt. 7 eng. miles from Steinkjer Aggebogen harbour on the gulf of Trondhjem, leads $1\frac{1}{2}$ mile steep and $\frac{1}{2}$ mile high-road. The distance from electric transmission line, which passes along the high-road, is abt. 1 eng. mile.

The Bjensaas mine is situated in the slope falling towards the southside of the Stammyr lakelet about $\frac{1}{4}$ eng. mile S.W. of Skrataas mine.

The Marken mine is lying abt. $\frac{2}{3}$ eng. mile east of Skrataas mine in the fields of Marken farm near the steepway elevated abt. 400 feet over the sea and distanced $1\frac{1}{2}$ eng. mile from Sunnan.

Climate.

The geographical situation of the Steinkjer district, Indherred, is exactly $64^{\circ} 3'$ lat. north, $11^{\circ} 33'$ long. east Greenwich. The climate of the gulf-basin influences upon this landscape. The head of the gulf appears not allways ice-free in the wintwr, although generally. The mean annual temperature is $+4^{\circ}$ Centigrade, in January - 3, in July +14, in all 110 cold days. The altitude of wet is 38' in average. The district is agricultural, the hills are woody.

Communications & c.

As mentioned above there is a steep-way from the two mines Skrataas and Marken down to the valley, but it is necessary to alter it for automobile transport. The cost of wintwrtransport by horse per ton of ore from the Skrataas mine delivered into railway-waggon amounts to kr. 3,50 + 3 sh. 2 d. By the use of automobil the transport cost will be reduced to kr. 2,00 per ton or less.

The main communications are excellent, viz. 7 engl. miles broad-railway from Sunnan to the harbour, by sea 215 nautical mls = 100 kmeters inland navigations from Steinkjer to Thondhjem, by railway abt. $65\frac{1}{2}$ engl. miles. See map 1.

The freight by railway to f.o.b. steamer per ton is at present, costs incl.:
 From Sunnan to Eggebogen kr. 4,75
 " " " Hommelviken " 7,00
 " " " Trondhjem " 7,75

It is said, that these prices will be reasonably lowered in the next future. The freight by sea from Hommelviken or Trondhjem to Hamburg or Bremen amounts to 12,50 per metric ton, to Antwerp kr. 15,00. From Eggebogen it will be an addition, say 2,00 crowns. Generally may be said, that the prices are on the descending scale, ~~after~~ ^{he} the informations of Bachke & Co. in Thronhjem, forwarding agents.

Labour Conditions &c.

The municipal conditions of Egge Parish at present are just like those of the plurality of Norwegian local bodies. There is a good deal of inaployment, and therefore the operation of mines should be of certain importance for the communal economy making the local authorities interested in the start of such undertakings.

The taxes. The land-tax is kr. 5,00 per unit (Norw. skyld-mark), the percent of income rate last year was 15, of fortune 0,4. A progressive scale of the former may be used for larger amounts. The fiscal tax is 6% of income and 0,2% of fortune. It is on account of the conditions reasonable to allow for an encrease of the rates, but this eventuality ought to be prevented by every new trade to be started within the locality.

As for the almsbox some annual impost is to be paid, say kr. 500,00. The labourers insurance (Norw.: Riksforsikringen) amounts to abt. kr. 60,00 per man and year and the employers part of the impost to the labourers sick-box (Norw.: Kredssykekassen) is 1/6 i.e. kr. 72,00 : 6 = kr. 12,00 per man and year for mines and additional works.

This particulars will be further illustrated by Mr. Kr. Nauf, serjeant at Kongsberg.

The wages are abt. 8 - 10 Kr. per normal day - 8 hours-, referring to the arbitration held this year. The prices are slowly descending to the new gold pari - 170% of the prewar - although restrained by the high taxes and house-rent, which encrease the present ratio from abt. 180 to nearly 200. (1927).

Table of pay per hour 1/7 - 1927:

	Minimum for Contractors Kr. 0,70	Ordinary wage per hour Kr. 0,80
A. Labourers under 20 years age		
B. " over " " " "		
1. Day-work: cobbing, dressing labourers and watchmen	" 0,80	" 1,00
2. Underground-work: miners &c., journeymen, chaffeurs, machinists ..	" 0,90	" 1,10
3. Artisans, mechanics and joiners	" 1,00	" 1,25

During next year a new arbitration is to be held, 1928.

The surrounding district is well populated, the inflow of labourers is good. There is much trade attacked the waterfalls along the Steinkjer river course, especially timbermills and cellulosa works. The Skrataas mines are situated so near the country, that the necessity of building lodgings for the labourers is not present, the housing conditions at Sunnan are good. The situation so near town and harbour in a rich agricultural district of course lighten the supply of everything aspecially victuals and wooden materials. The price of timber to day is kr. 14,00 per cub. meter = kr. 0,40 per square feet (engl.) See map II.

Historically.

The Skrataas deposit was discovered in the years 1880 and some researches had been driven by landlord Mr. Martin Skrataas and few others from 1886. In 1889 the claims were acquired by Messers Petersen & Luhnenschloss of Christiania for a sum of Kr. 25.000,00 and planned exploring work began in november 1889 under the management of Mr. Poul Holmsen, inspector of mines, with his son Mr. Holm Holmsen as mining engineer at the place. The number of hands was abt. 30. Steeproad from the mine to the valley was laid out and houses for resting and for the handpicking builded.

The result of the development of Skrataas mine after almost 7 months work was good. The occurence had been uncovered abt. 130 meters on the surface and to a debth of abt. 20 meters vertically followed there in the stratification 63 mtrs. 817 cub. mts. rough mass had been worked, handpicked and sorted in prima and second sort ore, respective 390 metr. tons, containing 33,0% Zn, 15,4% Pb, 1,6% Cu, and 12½ os. Ag and 1/6 oz Au, and 840 tons, containing abt. 13% Zn - the second sort of ore evidently also representing the amount of smalls -.

A proofcharge of 430 tons chiefly prima ore was 1890 sent to Antwerp, the result of the negotiations, however, was not satisfying, as the ore was consideres to be too complexe. Therefore Mr. Holmsen planned a scale of operation assuming the construction of the dressing plant, and the on the occasion a lot of handpicked ore was sent to a testing work, 1892. The mine and field had been surveyd 1890 and Mr. Delgobe, the manager of Vigsnes Copper Works gave a report of the matter.

As said, the result of the sale ore had been entirely discouraging, the zinc and silver contents only could be paid. The quotations of the time respective of zinc and silver was £ 22 and 44 d. per oz. The transmission only ferched the f.o.b.-price of Kr. 45,00 per metr. ton. It looked necessary to let all the ore be dressed in order to get paid the lead contents also.

The mine proprietors, however, was in want of sufficient money for such an undertaking, and therefore tried to make others interested in the affair. Allready in 1891 Mr. Lünenschloss applied to his friend in London, Mr. W. Johnsen, whose expert, having read the reports of Mr. Holmsen and Mr. Delgobe, adressed the proprietors themselves to put the mine into operation.

In 1896 the proprietors came in communication with the great Belgian zinc concern Société des Mines & Ponderies de la Vieille Montagne, which sent the mine expert Mr. Watteyne to Skrataas in 1899. In his report of 12/9 1899 he considers the deposit to be too small to be able to make his company interested and says: "Elle peut être suceptible de développement si l'on trouve de nouveau gites dans le voisinage et si le minerai peut être traite mécaniquement de facon a séparer le plomb argentifère de la blende et à enrichir celle-ci." As for the workability of the mine Mr. Watteyne calculates the total production cost of a mixed concentrate of the prima ore quality 33% Zn and 8 oz. Ag to be 52,20 Frcs. and the freight from Steinkjer to Antwerp 11,00 Frcs. The c.i.f. value of it being 91,80 Frcs. the net benefit should be abt. 30%. He supposed an annual production of 7000 tons of such concentrates for a period of 10 years, the mine worked down to a debth of 300 meters vertically.

According to the expressions of the experts the mine proprietors determined to operate the mine themselves. The above mentioned Mr. Holmsen Holmsen was engaged to be the manager of new researching work and a little waterfall was aquired to be the power-source of an eventual dressing plant. During the year 1900 levels were driven in the mine down to a debth of 48 meters added with some less stoping work. The development work began in springtime 1899 and continued till the end of 1900 performed with 20 - 25 labourers. 1589 cub. metrs. rock had been worked of which 1131 cub. metrs. in mineralized drifts. The raw ore was handpicked and sorted in 257 tons of prima ore, 231 ton of

second sort and 1818 tons of smalls. The 2 development works had cost abt. Kr. 47.000,00 and delivered 647 tons of prima ore having a f.o.b. value of abt. 30.000,00, further 2889 ton of wash-ore of abt. 11% Zn. &c.

Mr. Holm Holmsen and his brother Mr. Theodor Helmsen planned then the construction of a dressing plant alternatively for 5000 and 2500 tons of concentrates, further a wharf at Eggebogen harbour. 5 tons of second sort ore was sent to Friedrich Krupp, Grusonwerk in Magdeburg to be tested for dressing, the result of which, however, was rather unsatisfactorious, not only for the less amount of zinc in the blende-concentrate, abt. 35%, but also for the low extraction of this metal, abt. 70% and scarcely so much of lead in the galena-Concentrate.

The researches were continued with a number of 10 labourers until 1902.

Having spent about at least 75.000,00 Kr., the purchase included, in the undertaking and only got back 30.000,00 by sale of the prima ore, the proprietors came in financial straits. Fortunately the affairs of the Skrataas mine were undertaken at the end of 1902 by the above mentioned Mr. W. Johnsen and the other partners of the firm Johnsen & Jørgensen, Ltd., in London for an amount of Kr. 100.000,00.

These gentlemen were not minefinanciers and had chiefly intended to help their friend Mr. L., but now, that they had purchased the mine, they put ahead the developing work managed by Mr. Wielgolaski, mechanical engineer at the Røros Copper Works with a mining captain at Skrataas, hoping to be able to sell the mine again. Therefore negotiations for sale had been carried on in the years 1906-07 with the french concern: "Société metallurgique International", which sent an expert Mr. Tricon to Skrataas.

In his report of 15/9 1906 the latter declares likewise as Mr. Watteyne: "Que l'affair des mines de Skrataas est interessante, le mineral qui est complexe parait être vendable et lorsqu'on aura vaincu les difficultés de la separation mecanique difficile pour un mineral aussi complexe et qu'on aura isolés les différents métaux, zinc, plomb argentifère on peu esperer voir le prix de vente augmenter assez sensiblement. Que la Question de séparation mécanique est la question importante, et la résoudre immédiatement et qu'il ne faut pas se dissimuler qu'on se heurtera à des difficultés de ce côté." Mr. Tricon estimates the amount of ore insight by his visit at the mine - reckoned as dressed up to prima-ore grade to be abt. 10.000 tons, the average depth being 30 meters.. He calculates an annum of this amount and the mine during an amortisation period of 10 years thus worked down to 300 meters depth. He notes the c.i.f. value per ton to be abt. 100 Frcs. and the total c.i.f. expences abt. 70 Frcs., i.e. net benefit 30%. However, he considered the matter to be of little importance to his company.

The mentioned affairs thus failed by the matter of fact, that the Skrataas ore was of the feared mixed type, which still waited for usable concentrating method, further, that the occurrence was considered to be too small to the purposes of the applicants.

During the period 1903-09 the development of the mine had been carried on with a number of 2 - 8 labourers. The mine was sinked down to the depth of 78 meters and a new level driven in there. Likewise was the level on 40 metres depth driven to the west and the mineralized stretch thus extended to be at least 75 metres. Further several crosscuts were driven in order to research the shists in the hanging wall as well as in the footwall. The output of the work in the mineralized drifts was in all 550 cub. metres of rough mass, which by hand-picking gave 243 tons of prima ore, 124 tons of second sort and 747 tons of smalls.

Later on different methods for the economical utilisation of mixed zinc-lead ores have been tried especially elektrometallurgical and flotation processes and new views appeared for the affair.

At Traag Mines on the gulf of Langesund an English company had erected an Elmore flotation plant. In Drammen had Belgians constructed an electrometallurgical plant for the utilization of zinc ore from the Konnerud mines. Hohenlohe Werke had purchased the Hadeland zinc deposits trying to concentrate the rather clean zincbearing ore on vanners in connection by Krupps flotation process. An anglo-german company purchased Husvik mines in Nordland intending to use Dr. Hommels zinc wprocess, while another Nordlandish zinc deposit, Mofjeldet in Ranen was operated by Norwegians, who had secured the so-called Delaval's cyclon process, an electrotermic method. Further had the counts Henckel v. Donnersmark tried different places, viz. Hiteren mines and Glomsrudkollen mine in Modum using Mr. Otto Spinzig as their intermediary and having certainly intended to try Dr. Hommels method, mentioned above.

The same Mr. Spinzig had in the years 1912-14 got a right of option upon Skrataas mines and had planned considerable researching and developing work there, when the affair unfortunately was interrupted by the war.

Since 1914 the mine has been laid down and ran full of water in 1919, and has not been emptied again before 1925.

During and after the grand war new methods appeared pretending to solve the difficulty of the complexed-ore concentration, the so-called Broken Hill Problem. In 1921 a lot of Skrataas second sort ore was tested for the method of A/S Elektrolytzink, Hadeland, Norway, and in 1922 likewise by the Metals Extraction Corporation electrolytic entreprise at Swansea, although without definite result with the lowgrade ore. For all that, the electrolytic methods may be the matter of future for mined ores, but rich ore or ore concentrates ought to be the raw-goods for the sulphatization (light-roasting) and not ~~low-grade ore~~ low-grade ore. Therefore the ore concentration has a field.

In the meantime the flotation processes has passed an enormous development out of the bulk of more or less usable concentration methods, which successively were distanced. The selective oil flotation with agitation and especially with pneumatical arrangement has gained the best results. In 1923 the Skrataas ore was successful tested for the Gallow's Pneumatical Flotation Process, whose representative in Norway is Mr. Ferd. P. Egeberg in Oslo. At present the same method has reached still better results with similar ores, viz. that of Mofjeldet in Ranen.

On account of the often forwarded postulate, that the Norwegian zinc deposits are too small to be able to interest the great Belgian refineries, the autor has since 1922 tried to form a federation of Norwegian zinc mines and the above mentioned Mr. Holm Holmsen, director of mines, adopted the idea and a Norwegian zinc company with continental capital was formed in 1926. This company proposed to put different researches to work in Skrataas and Marken Mine, but hitherto not being accepted by the proprietors as for the impossibility to enter into contact with the real applicants, the mines having been offered for sale ~~on second hand~~ on second hand.

During the last year the deepest level of Skrataas mine has been driven further on to the west, hitherto 25 meters and the lode in this depth followed abt. 60 meters in all, and a parallel vein is reached by crosscut.

Till now the proprietors' expences by the purchase in 1902/03, the development 1902-09 and 1927, the maintance since 1902 and the emptying in 1925 have been about Kr. 335.000,00. The proprietors are in order to procure sufficient development and construction capital proposed to try to form a joint stock company into which they should enter with their mines and let them be put in operetion an the lines of the selective flotation process. On the other hand, they are also willing to sell the mines for Kr. 100,000,00 cash.

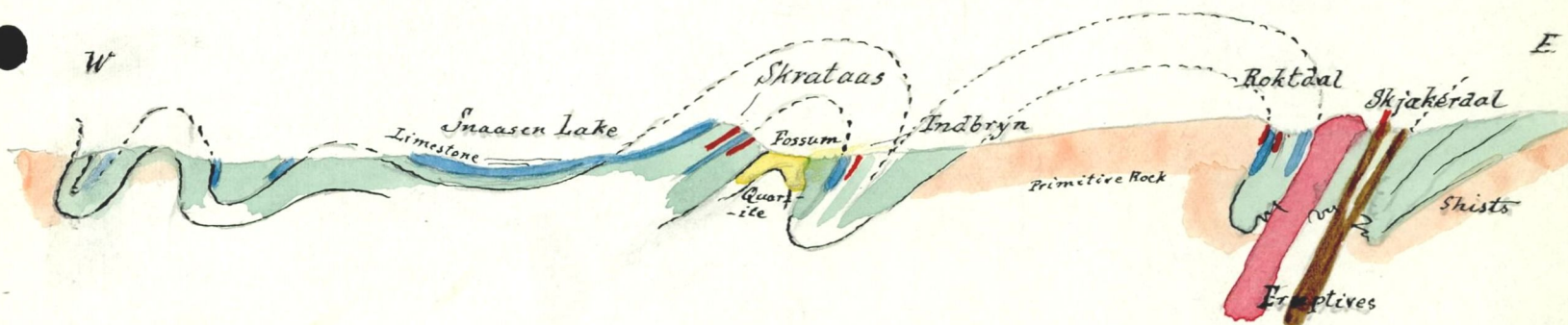
Geologically.

The predominating rocks of the Inntrøndelagen district relate to the formation of Nidrosian shists, generally regarded as the deepest and oldest layers of the Silurian sediments, Cambro-Silur. It is metamorphic (transformed) shists, alternating with layers of impure crystalline limestone or dolomite and of quartzite. The strata of the entirely folded shists runs almost NE, performing a big basin jammed up between the gneiss or primitive rocks of eastern Indherred and of Fosen.

Within these shists mainly occur ore deposits of the same outline as the injective culriferous iron-sulphides of the region, the chief minerals, however, being blende besides the pyrites accompanied by quartz and other minerals. The theory is, that the ore has found its way along superposed strata of rather soft shists, chlorite and talc, filling the pliation-fissures with this material from below.

As for the origin of these ores based upon the said hypothesis, also from an eruptive magma, such massives granite and gabbro occur in Skjækerdalen east, and the zincore deposits hitherto found occur along east-west from Rokdalen over Indbryn to Skrataas from the said eruptive massives. This phenomena is shown upon the enclosed geological map and upon the geological section below.

The mentioned ore deposits, which will be detailed here, appear in a zone of phyllite shists between the outcrop of limestone layers just over quartzite strata. At Skrataas they have a local stratification of NE to East performing a bow from the Svenning farms to the east about 3 engl. miles towards Sunnan on the Snaasen lake. A kind of soft argillaceous mica shists and chlorite shists occur in the hanging wall and a couple of thousand meters at least to the north, while a heavy kind of shists, amphibole-quartz-mica and quartzite shists are shiefly seen in the field behind the footwall. The latter type of shists generally disseminated with pyrites, here and there containing veritable deposits to be seen chiefly in the amphibole rocks.



Geological Section (east-west) of Indherred.

Of course there is prospected within this geological limits, however, on account of the covered ground, only few ore deposits of importance have been found till now.

The Zinc-Oredeposits.

Skrataas.

The occurrence of Skrataas appears almost in the middle of the stretch from Svennung farms to Sunnan. The Stratification of the ore-outcrop is almost East-West 10° to North with steeply graded dip abt. 60° with direction to the north, almost like that of the shists. Of course is the stratification as well

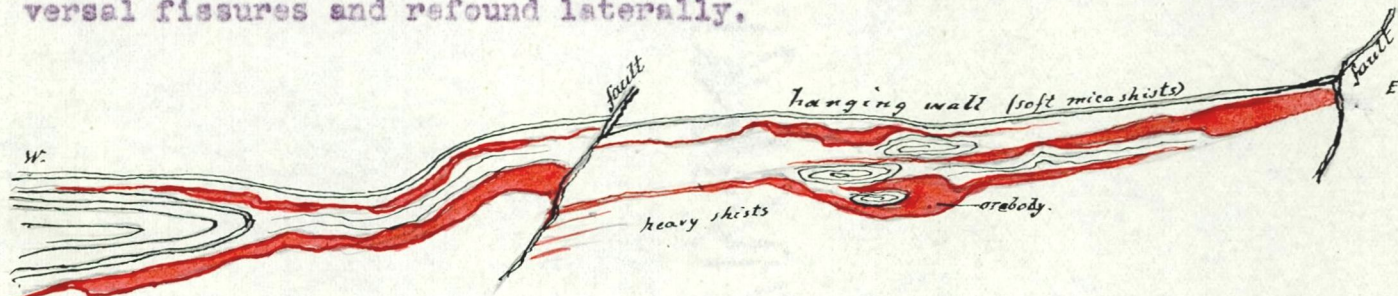
the dip of the veins frequently shifting often divided into branches and parted in lenses only partially following the main shist strata, an evidence of their eruptive origin. To the west the Skrataas veins have marked dip in the stratification, to the east the main one makes a serpentine and is possibly cut off by disturbance. The mentioned dip in the stratification is abt. 38° with the horizontal plan and may be the proper line of displacement, and the orebody might be refound somewhat displaced to the north or south.

The filling of the veins partly consists of quartz or a mixture of quartz and calspar, but mostly of ore. The valuable minerals, being intimately mixed, are argentiferous blende and argentiferous galenas, further ironpyrites and chalcopryite, the latter especially occurring in the quartz, which also carries traces of gold. The ironpyrites occur more richly along certain strata in the footwall, appearing in separate crystals to be seen especially in the western stretches.

The orebody has a marked hanging wall of light shist behind which the quartz and the ore lenses occur together with chlorite shist lamels often so much folded and twisted, that the ore so to say is hidden into the shist as was it marrows in a bone.

As for the continuance of the ore-veins in the depth it is remarkable, that the occurrence shows the same feature on the 3rd level, abt. 30 metres. depth as it does on the first and 2nd level, respective at 20 and 40 metres. depth. This fact will be admitted by regarding the enclosed map Nr. 6.

Below is given an illustration of the veins on the 2nd level, abt. 40 meters depth. The lenses are of more or less extent often displaced by transversal fissures and refound laterally.



The Skrataas occurrence has been followed with uncoverings in the field about 130 meters (400 feet) and hitherto underground to abt. 80 metres. depth, vertically = 90 metres. along the dip and abt. 80 metres. in the stratification.

Originally the mine has been worked from the western outcrop of the veins, The Fund Mine, where a sink was driven down to 20 metres depth and level from here east and west showing thicknesses respectively from 0,5 to 1,5 and from 0,4 to 0,7 metres. The outcrop of the eastern veins, The Big Mine, was also followed in the depth with a sink, and after some researches, thus a level on 14 metres. depth developing a narrow vein in the footwall with 0,2 to 0,4 meters thickness, it reached the 20 metres. depth and the two sinks were connected by the level driven. The veins there ~~shows~~ shows thicknesses in all up to 1,6 metres. The latter sink, which served as hoist-shaft, was plumbed down to 40 metres. depth and passes almost there the eastern ore-limit, which appears abruptly ~~against~~ a clay fissure with rather full thickness and indicates that a displacement should have taken place. A level ~~was~~ was driven to the west showing thicknesses from 0,4 up to 2,6 metres., but followed 35 metres. from the shaft a point is reached where the branching of the veins extends the ore area rather much although less mineralized per unit. From here an inclinal was driven to abt. 48 metres. depth showing an average thickness of 0,6 metres. in 32 metres. length. Level 1 was driven 82 metres. in all, but from 63 west where the veins began to straggle the level has evidently been driven off from the real vein, which stretches almost east-west, and followed the hanging wall and a striff of ore 18 metres. to NW to W. See map No. 6.

Crosscuts were driven from level 1 20 meter north till the limestone had been reached and east in both directions in order to refind the probably displaced orebody. Further were crosscuts driven from level 2 to the north east of the displacing fissure in order to refind the orebody, and to the south intending the same, but giving sooner up. West of the said fissure a long crosscut was driven to the south intending to reach the southern parallel ore stretch prospected in Bjønsaasen hills. Its length hitherto is 138 metres.

The next work was made by following the ore veins on level 2 to the west. The drift advanced along the hanging wall laying bare vein-thicknesses from 0,1 to 0,4 metres. After abt. 15 metres. drift this vein disappeared and a clay-fissure crossing the level was reached, followed by crosscut to the south 10 metres. along its westside and veins, respective of 0,9 and 0,4 metres. thickness were cut. The level was driven further along the hanging wall following a narrow vein 18 metres. when a new crosscut was driven to the south and ore-veins of 0,3 and 0,6 metres. thickness were cut, however, a width of 6 to 7 metres. was mineralized although somewhat slighter.

The occurrence has been followed further 48 metres. in the depth vertically along the eastern oredisplacing fissure, the ore-limit also, and a new level was driven from 78 metres. depth to the west abt. 37 metres. showing thicknesses of the veins from 0,4 up to 1,5 metres. From this place the continued level extended with crosscuts and driven about 25 metres. further to the west shows just the same feature at the veins as the level 40 metres. above, the very same parallel veins and the same clay fissure, promising the proper continuance into greater depth.

The Bjønsaas Mine.

The shists of Bjønsaasen appears quarzy along the strata, which is parallel to that of Skrataas, distanced abt. 150 metres. from it. These shists are not folded like those of Skrataas, and the occurrence seems to be on off-shoot of a mineralised stretch in them. The ore mixed with the quartz is ~~xxx~~ ironpyrite in separate oristals as seen in the footwall of the Skrataas levels. Blende occurs only sparingly. There is a crosscut, a sink and the beginning of a level.

Some, however, talk for the opinion, that the Bjønsaas stretch is the very same as that of Marken mine although occurring abt. 1 engl. mile distanced. Therefore the long crosscut from level 2 in Skrataas mine has been driven towards this stretch, and being 138 metres. long it should reach the same 10 or 15 metres. forward.

The Marken Mine.

The Marken occurrence follows the shist stratification along a line certainly parallel to that of Skrataas, but the mineralization is the very same. It is remarkable, that the vein seems to have the same characteristic dip in the stratification as the veins of Skrataas, although the development scarcely has begun. The orebody has been followed in the depth by an incline sink about 9 metres. deep and a level so far begun.

The Indbryn Claim.

The Indbryn zinc claim is so far uncovered as to notice the sort of ore, which is blende chiefly scattered in the heavy folded dark mica shist. There is only some ironpyrites to be seen in the twisted lamels besides the zincblende, galena and chalcopryrite scarcely not.

The claim is distanced about 3 Engl. miles from Skrataas on the eastside of the Steinkjer river course on the direct line from this mine up to Roktdal claims.

The Roktdal Claims.

The Roktdal claims are situated about 14 Engl. miles east of Skrataas on the Roktheia hills abt. 1600 feet over the sea level and abt. 7 Engl. miles from road, further 3/4 Eng. mile distanced from the Rokta river in the

valley named likewise and abt. 900 feet over it.

The deposits occur in the mica shists described above, and near the limit of the primitive rock and near limestone layers. Not much ^{work} has been done except uncoverings. The ore is of the complexe type similar to that of Skrataas, viz. ironpyrites, blende, galena and chalcoppyrite.

Several other Claims are not much developed and ought to be thoroughly re-searched. Most of them are situated along the stretch of Skrataas and Marken mines.

Legal Conditions.

The ore deposits belong to the firm Johnsen & Jørgensen, Ltd., London, whose representative and partner in Norway is Mr. Ivar Enger, Oslo. The property consist in 2 mines and 38 claims. Allthough the main mine has been worked before the acoearance of the concession law, it is, on account of the long laying down, necessary to apply the government for concession.

The 10% right of the settlers is long ago relinquished. As for sufficient ground for buildings, transport &c. there is contracted with the respective proprietors.

As for concession, there are no general purposes, each item has been separately dealt with, and it is understood, that the present time of setting should secure favourable conditions. The practise has been the playment of an annual impost or a definite amount for the concession period appointed to last 40 years.

The Quality of the Ore.

As mentioned above the ore relates to the socalled complexe type with zincblende as the main ingrediant, then pyrites, galene and chalcoppyrite, all intimely mixed. The accompanying rock minerals are quartz, slightly of calspar besides the shist.

According to the register of the 3 short working periods there are produced 891 tons of prima ore, 1195 tend of second sort handpicked ore and the quantity of smalls amounted to 2565 tons.

Almost all the prima ore has been sold and therefore carefully assayed, see the table below:

	1	2	3	4	5	6	7	8	9	10	11	12
			1892	1896		99	99		99		05	
Zinc	34,37	33,11	33,22	35,10	33,00	34,10	37,71	34,28	33,64	33,15	33,96	33,22
Lead	16,87	15,37	7,87	7,10	10,90	2,86	3,27	14,16	17,09	10,90	10,71	7,87
Copper	1,28	1,60	1,73	-	1,60	6,16	3,99	1,33	0,40	1,28	0,80	1,73
Silver	400	387	210	186	380	276	252	384	244	260	80	210
Gold g/t	4,5		trace							5		
Arsenic						0,00	0,03					
Antimone							0,02					
Iron			8,42				9,53	11,86			6,72	8,42
Sulphur							29,61	32,59			25,55	
Alumina							1,36				5,15	
Lime							0,05				3,07	
Baryte							4,03					
Strontian							0,00					
Silica	4,50	6,35				9,14	10,60	5,74			13,82	

The average contents of prima ore should be:

34,00% Zn, 10,40% Pb, 9 oz. Ag and 2 or 3/16 oz. Au.

Sample No. 1,2,5,8 and 10 are assayed by L.Schmelck, Christiania, in 1889, 1890, 1899 and 1900.

"	"	3	is	"	"	R.Presenius, Wiesbaden, in 1890.
"	"	4	"	"	"	Johnson & Mathews, London, in 1890.
"	"	6	"	"	"	Augenot, Antwerp, in 1899.
"	"	7 and 9	are	"	"	l'Institut Maurice, Bruxelles, 1899.
"	"	11	is	"	"	Cornelius, Trollhättan in 1905.

Some assays have been made to ascertain the alloy of precious metals in the different minerals. Thus the amount of silver in pure galena should be abt. 0,17% varying from 0,16 to 0,18, and that of the pure blende 0,02%. As for the alloy of gold samples of quartz have been assayed by Schmelck in 1900 and 1902 with the following result:

	g/ton Ag	g/ton Au
Quartz with some chalcopyrite &c.	-	5
Quarzy foldsphere "	-	5
Blende	-	0
Quartz containing much "	520	4,5

The chalcopyrite should probably contain silver and thereby cause the rather variable silver content of the ore. Whether the chalcopyrite contains gold has not yet been settled, however, a couple of samples of rater pure quartz from the bottom of Skrataas mine taken in 1927 contained trace of precious metals being assayed at Kongsberg Silverworks.

2.

The Second Sort Ore.

An average sample of 5 metr. tons of second sort ore sent to be tested for dressing at Grusonwerk 1900 has been assayed there, further the stored quantity at the mine, 1195 tons has been thoroughly sampled in 1925 and 26, and assayed with the following result:

	1	2	3	4	5	6
Zinc %	14,67	20,22	15,50	17,23	14,55	15,43
Lead %	3,33	6,28	4,20	6,25	4,96	4,70
Copper %	1,40	3,02	1,55	-	-	-
Silver g/ton	-	220	150	-	140	168
Gold g/ton	-	-	4	-	-	5

Nr. 1 is assayed by Grusonwerk in 1900, the others by Kongsberg Silverworks and Heidenreich, Oslo. The average contents of the second sort ore is about: 15,50% Zn, 4,70% Pb, 0,015 % Ag and probably 5 g/ton Au.

3.

The Smalls.

The stored heap of smalls at the Skrataas mine, 2565 tons, has also been carefully sampled in the years 1925 and 1926 and ~~the~~ samples assayed at Kongsberg Silverworks as follows:

Zinc %	8,75	11,60	8,50	10,40	9,40	9,10	9,70
Lead %	2,50	4,00	3,00	3,60	3,20	2,30	3,40
Silver g/ton	-	-	-	128	100	80	100
Gold g/ton						3	?

The average contents of the smalls should be: 9,80% Zn, 3,2% Pb, 100 g/ton Ag and some gold.

Mr. Holm Holmsen, manager of the mine in 1900 has elaborated an estimate of dressing based upon a product analogue to the prima ore, 34% Zn. He reckoned the second sort to contain 40% of this amount, the smalls 25% and should these components of the handpicked ore contain respective 13,60% and 8,50% of Zn.

In this manner Mr. Holmsen found, that the raw-ore, worked in 1900

contained 31,7% of such a product = 10,73% Zn, and the raw ore worked in 1900 25,40% of it = 8,63% Zn. Mr. Holmsen reckons the spc. grav. to be 2,8, which is too little for an ore of such a mineralization, the figure must be 3.

The total result of the development work as for the ore quality has been the following:

According to the register from the 3 working periods during the interval 1889 - 1909 have 4400 cub. metres. rock in all been dug out, respective 540 from the main inclined shaft, 1260 from crosscuts and abt. 100 from claims. In all abt. 1900 cub. metres. of waste rock from dead drifts, the rest abt. 2500 cub. mtrs. relates from mineralized drifts. The latter called raw-ore = abt. 7500 tons was cobbled and sorted as follows:

cub. mtrs.	Prima Ore tons	%Zn.	Second sort tons	%Zn	Smalls tons	%ZN	Total Production tons	Zn %Zn	Tons per cub. mtr.
817	391	34	840	14,5			1231	20,7	1,51
1131	257	"	231	"	1818	9,5	2306	12,8	2,04
550	243	"	124	"	747	"	1114	15,4	2,02
2498	891	34	1195	14,5	2565	9,5	4651	15,6	1,85

The raw ore production also amounts to abt. 2500 cub. mtrs. x 3 = 7500 metr. tons of 9,67% Zn.

On account of the wellknown fact, that the amount of smalls generally has a mineralization nearly equal to that of the whole body of worked ore from mineralized drifts, can the metal alloy of the said constituents be means of the above mentioned working results, viz.:

$$890. 34/100 + 1195 . 14,5/100 + 2565 . x(100 = 7500 . x)100$$

$$x = 9,64\% \text{ Zn.}$$

Tons Handpicked Ore per cub. meter.

The result of the developing work hitherto driven may be illustrated in the amount of handpicked ore per cub. mtr. worked rock, viz.:

In the first period, 1899	1,51 tons of 20,7% Zn
" " " " , 1900	2,04 " " 12,8% "
" " period 1902-09	2,02 " " 15,4% "

The average result should be abt. 2 tons of 15% Zn per cub. mtr.

Assays of the Ore from Marken Mine.

A couple of samples taken from the heap of handpicked ore from Marken mine have been assayed in 1900 with the following result:

	Sample 1:	Sample 2:
Zink	26,50 %	26,14 %
Copper	9,30 %	0,55%
Iron	13,20 %	19,73 %
Sulphur	27,83 %	29,85 %

Assays of the Ore from Indbryn Claim.

	Sample 1.	Sample 2.
Zinc	4,66	9,35
Lead	0	0
Copper	0,22	1,20

The Dressing of the Complex Ore.

A cobbled product containing 15% Zn, 4,7% Pb, 5 oz. Ag and 2/16 oz. cannot be advantageously sold, but ought to be mechanically enriched by dressing. Even the concentration to prima-ore grade, i.e.x. 34% Zn &c.-product, cannot pay the cost of the present quotations.

As said before has 5 tons of second sort cobbled ore been sent to the testing work Grusonwerk in Magdeburg anno 1900. 2 separate tests had been made with respective 2 m/m and $\frac{1}{2}$ m/m size of corn upon setzmachines and shaking tables (vanners) with result as follows:

A. Original ore 2 metr. tons of 14,67% Zn and 3,33% Pb, grinded to 2 m/m.

Products:	% goods	% Zn	% Pb
1. Galena intermediary	4,10	18,88	17,39
2. Blende Concentrates	30,25	36,69	6,99
3. " Interm.	17,75	12,87	2,30
4. Tailings	47,90	2,36	0,48

B. Original ore 3 metr. tons of the same Zn and Pb contents, grinded to $\frac{1}{2}$ m/m.

Products:	% goods	% Zn	% Pb
1. Galena Concentrates	1,01	7,75	63,93
2. " intermediary	2,45	16,09	30,09
3. Blende Concentrates	29,76	34,56	3,98
5. " interm.	24,21	9,81	2,50
6. Tailings	42,57	3,26	0,35

As appears from this figures, the main minerals of the ore, viz. blende and galena are so intimately mixed together, that a further grinding than to $\frac{1}{2}$ m/m size of corn = 30 mesh is necessary to make the production of sufficient highgrade sale concentrates possible. The 30-mesh goods treated on vanners gave a zincproduct analogue to the cobbled prima ore, 34,5% Zn and abt. 4% Pb, i.e. 70-80% extraction, and a lead-concentrate with abt. 40% Pb and 13% Zn, abt. 40-50% extraction. The metallurgical plants of Belgium would only pay Kr. 65,00 c.i.f. for such Blendeproduct and Kr. 110,00 for the argentiferous galena prod. per ton, in average Kr. 77,00 per ton of total product.

Tested in magnetic separation plant an intermediary product, having been slightly roasted, certainly reached 44,3% Zn, however, with the lowgrade extraction of 38%.

Older Flotation Processes.

The results of flotating mixed zinc-lead ores by Elmore's vacuum Process at Traag Mines didn't finish successfully. Blende had no good tendency to adhere to gas bubbles at an arrangement of that kind, nor did galena. The same difficulty met the tests of Krupps flotation process applied at Grua, Hadeland, even with the only blende-bearing ore.

Metallurgical processes.

Of course the mixed ores can be treated by means of the common systems of metallurgical processes, however, the performance of these requires traditional experience, very important plants, which again condition great ore-supplies in Norway to be established with propriety there. And therefore attempts have been made to connect all Norwegian zinc mines in order to warrant the construction of central metallurgical works in the country.

As for the metallurgical treatment of this complex ores within the country, different methods have been tried during the last couple of decennaries. The Swedish engineer Delaval's so-called cyclone-furnace, Major Krefting's termo-electrical furnace &c. have been tried for years, but unfortunately, the processes failed on account of the tendency of the ore to sinter and the zinc-oxide-smoke to tighten the furnace outlets and passages to condensing chambers

The autor does not know Mr. F. Tharaldsen's carbid method for the reduction of zincsulphide, which is said to be tested at the Odda zinc-works during this years. For all that a metallurgist cannot disguise that impression, that only the electrolytical system, seems to lead into the right direction. For all that, an electrolytical plant for zincproduktion in Drammen has been laid down &c. &c., and the Skrataas ore has been sent to a couple of electrolytical plants to be tested. In 1920 to the plant of "Elektrolyt-Zink" at Grus, Hadeland, but the sulphatisation of such lowgrade goods wouldn't be effective, consequently - a previous mechanical concentration was urgent.

Another sample of cobbed ore was sent to the plant of the "British Metals Extraction Corporation" at Swansea, certainly with the very same result: the statement of the necessity of a concentration by dressing before roasting.

In the meantime has the flotation processes passed a noteworthy evolution in order to differentiate the special minerals after their flotating capacity to select the constituents of a pulp. In 1923 were samples of Skrat-
aas cobbed ore sent to Mr. Ferd. P. Egeberg, the Norwegian representative of the Callow's Pneumatical Flotation Process, to be tested for this process at his laboratory in Oslo.

Allready in 1924 he arrived at encouraging results, as follows:

	100,0% rawgoods	20,22% Zn	6,26% Pb.
C.	6,6" Pb-conc.	21,00% "	37,88% "
	36,5" Zn- "	49,15% "	8,65% "
	56,9" Tailings	1,60% "	1,10% "
D.	The almost same rawgoods.		
	5,6% Pb-conc.	19,60% Zn	38,70% Pb
	32,0% Zn- "	48,24% "	4,22% "
	62,4% Tailings	11,67% "	1,48% "

The extraction of zinc test C was	88,8 %
" " " " " D	76,4 "
" " " " " C	40,0 "
" " " " " D	34,5 "

Certainly, the result are depending upon the size of corn using vanners as well as flotation, a grinding down to 60 mesh should help. Consequently a successive treating upon vanners at first in order to save the gold contents either it occurs pure in the quartz or as telluride among the sulphides. The fact is by flotation, that the gold-iferous ores loose their gold-contents in the tailings, having been insufficient grained.

Mr. Egeberg har treated the galena-concentrates upon Wilfley table and got a product, containing 66,8% Pb and 2,65% Zn similar to the Pb-concentrates B.1., while an intermediay product returns to the system. Along this line, the use also of vanners as well as Callow cells, it has been possible to produce a Pb-concentrate of 43% Pb with 85% extraction, and a Zn-concentrate of 51% Zn with 92% extraction, and he states, that the Skrataas ore is an ideal one to be treated by flotation.

The Skrataas Concentrates.

Based upon these tests the original cobbed ore treated by the selective flotation process &c. should be concentrated into the following products reckoned in percent:

						Extract %
100 %	of original cobbed ore	of 15% Zn and 4,7% Pb and 0,015% Ag				
28 "	" Zn-concentrates	" 48% "	" 2,0% "	" 0,018% "		90%
9%	" Pb- "	" 8% "	" 43,0% "	" 0,100% "		92%
and:62%	" Tailings	" 1,4% Zn "	" 0,4% Pb "	" 0,0015% Ag.		

The gold contents should go into the Pb-concentrates on vanners, say 50% extr.

The c.i.f.-value of the Concentrates.

The London quotations of the 3 metals zinc, lead and silver have varied since 1925 as follows:

		Zinc £ per longton	Lead £ per longton	Silver d per ounce
Januar	1925	38 2/3	40 2/3	31 3/4
November	"	38 3/8	36 1/2	32
April	1926	33	29 1/2	29 7/8
December	"	33	29 1/2	24 5/8
Februar	1927	29 3/8	26 1/2	24 7/8
Primo October	"	26 3/8	20 1/4	25 1/2
Medio	"	27 1/2	20 7/8	26
Primo November	"	26 1/2	20 1/2	26 1/2
Medio	"	26 3/16	20 7/8	26 11/16
"	April 1928	24 7/8	20	26 1/2

Since 1925 it has been evident, that metals pretended to reduce notation by pre-war characters, disproportioned to the changed price of other materials and of labour, the ratio of which all world over still is 170 or higher. In 1912 the quotations were respective 25 £, 19 £ and 25 d.

Rise in the prices of zinc generally reduces the silverprice, falling off because silver to a great extent is a residual product at the zinc-refineries. Therefore, in all likelihood it is to reckon upon the minimum with the present quotations of the three metals, viz.:

P. = Zinc 25 £ per metr. ton.
 P. = Lead 20 £ " " "
 Silver ... 26 d. per ounce.

The c.i.f.-value per metr. ton of the Skrataas concentrates should then be the following:

1. Zinc-concentrate	48% Zn and 180 g/ton Ag.	Kr.	Kr.
Zn-contents	$0,95 \frac{P. (48 \div 8)}{100} \div 0,12 P = \dots\dots\dots$	110,64	
+ Ag-contents	$(180 \div 150) \frac{68,58}{2000} = \dots\dots\dots$	1,02	111,66
2. Lead-concentrate	43% Pb. 0,1% Ag and ? 22 gram gold .		
Pb- contents	$(43 \div 4) \frac{P.}{100} \div 3 £ = \dots\dots\dots$	87,75	
+ Ag-contents	$1000 \cdot \frac{90}{100} \text{ d per oz.} \dots\dots\dots$	59,47	
+ Au-contents	$22 \cdot 2,40 \dots\dots\dots$	52,80	199,84

The value of 1 ton cobbed ore of 15% Zn &c.

28% Zn-conc.	Kr. 31,26
9% Pb-conc.	" 17,99
Sum:	Kr. 49,25

The c.i.f.-value per ton of average concentrates is then Kr. 133,00 = abt.

Estb. 7.6.0.

The Ore-Quantity.

The thicknesses of the orebody of Skrataas mine are different as well in the stratification - especially to the west, where the veins intersect - as in the depth. The thickness of single veins between limits as one thumb and 3 feet even up to 5 feet. The average thickness of them may hardly be said - probably about one foot -, but the width of parallel veins, the mineralized area is much greater. Therefore the worked stopes and galleries are carefully measured in order to ascertain this ore area, viz.:

	Developed length of the orebody in the stratific.	Length of galleries	Average width of the same
	Mtrs.	Mtrs.	Mtrs.
Surface	70	70	40
Gallery 14 mtrs. depth	68	55	3,20
Level 1. 22 " "	82	67	4,00
Gallery 31 " "	15 totally	15 valuable	2,50
Level 2. 38 " "	76	50	3,40
Gallery 50 " "	40	40	2,40
Level 3. 78 " "	56	56	3,00
Averaged	58	67	3,20

The average width of the drifts is also 3,20 mtrs. = 10½ feet.

The full length in the stratification hitherto developed has not been followed with galleries to the west in each level, and therefore the average width of the mineralized area is somewhat greater than 3,20 mtrs. Further has not all ore been stoped from neither the hanging nor the footwall.

For all that the ore area is here reckoned to be:

$$76 \cdot 3,20 = 240 \text{ square mtrs.} = \text{abt. 2400 sq. feet.}$$

Ore in-sight.

The average mineralized stretch hitherto developed down to 80 mtrs. depth vertically is 67 mtrs. The average ore area under the category ore in-sight should then be:

$$67 \cdot 3,20 = \text{abt. 215 square mtrs.}$$

To 80 meters. depth the following quantum should stand:

$$215 \cdot 80 = 17.200 \text{ cub. mtrs.}$$

Tons cobbled ore reckoned per cub. mtr. = 2,00 will give an amount of

$$2 \cdot 17.200 = 34.400 \text{ tons 15\% ore per cub. mtr as ore in-sight.}$$

Probable Ore.

The extension of the Skrataas occurrence in the stratification has been found to be greater to the west in the intersected parts, where the ore is to be seen in the breast of each gallery. On level 2 the developed stretch is 76 mtrs or more and the orebody continues. The probable ore area should also be:

(76 ÷ 67) · 3,20 = 35 square mtrs. and to a depth of 80 mtrs. 35 · 80 = 2800 cub. mtrs. to which comes the triangle below the deepest level down to

$$80/2 = 40 \text{ meters depth below level 3, which gives:}$$

$$40/2 \cdot 56 = 3584 \text{ cub. mtrs. added to 2800 = 6384 cub. mtrs.}$$

In tons of 15% cobbled ore also 2 · 6384 = abt. 12.700 tons probable Ore.

Added to the amount of ore in-sight:

$$34.400 + 12.700 = \text{abt. 47.000. tons 15\% ore.}$$

Possible Ore.

Above is said, that the occurrence relates to the so-called injec-

tive deposits, which mark the Nidrosian shistformation. The extension in the dip of these deposits is generally important and several of them have been in this direction several hundred metres., the Røros mines even up to a couple of kilometers, certainly rise workings. A supposition of an extension in the dip-direction per example of 180 meters, should absolutely figure within reasonable limits. The fact, that the occurrence of Skrataas in abt. 80 meters depth shows the same extent and the very same particularities as it does at abt. 40 meters depth, should certainly indicate a continuation to greater depth.

Remarkable is also, that the foreign experts, who have visited and described the mine, Mr. Watteyne and Mr. Tricon, both supposes a depth of 300 meters at least.

Also in the stratification is a greater extension beyond a doubt. As said before appears ore everywhere in the breast of the western galleries, The occurrence being uncovered on the surface over abt. 130 meters stretch in the stratification, should probably be followed 100 meters in this direction underground.

Some places the real orebody strikes off from the certain hanging wall of the net of veins, thus on level 1 west, where the gallery has been directed forwards NW following the hanging wall, while the orebody continues west, certainly dipping the stratification. A crosscut in the footwall longest west on this level should be of importance. This supposition on the first level is based upon the development work hitherto driven in the western part of the second level 20 meters deeper, as well as that of the 3rd level 60 meters deeper, see on map nr. 6.

The calculate with 80 meters extension in the stratification should therefore be within the limits of probable ore.

As for the possible orequantum a calculation with 100 meters extension in the stratification and at least 2 . 80 = 180 meters in the dip = 160 meters vertically - gives:

(I) $160 \cdot 100 \cdot 3,2 \cdot 2 = \text{abt. } 100.000.$ tons of 15% ore, half of which counting the quantum of ore in-sight and ore probable, the other half the possible ore.

(II) And a vertical depth of 300 meters should give abt. 180,000. tons of such ore.

Reserves.

The outcrop of more or less mineralized stretches of shists vest of Sunnan has been followed over abt. 3 Engl. miles, and prospected on both sides of Skrataas hills, abt. 10.000. feet to the west and abt. 6000 feet to the east reckoned from the main mine. The different claims, however, are less researched.

About 2/3 Engl. mile distanced east of Skrataas mine lies Marken mine. This has hitherto been sinked only 9 meters and driven few meters in the stratification. As mentioned above, the orebody seems to have almost the same characteras that of Skrataas, the same dip in the stratification, and therefore it should be reasonable to begin some developing work to the west, not on the surface, but from the bottom of the little sink.

The Bjønnsaasen stretch should be reached in a depth of abt. 35 - 40 metrs. by means of the crosscut from the 2nd level of Skrataas mine hitherto 138 metrs. long. Probably remains only 10 or 15 meters.

The other claims, 38 in all, ought to be thoroughly researched with uncoverings &c.

Outsiders.

The Bjønsaas mine is belonging to Mr. Fr. S. Stuler, Steinkjer, the only outsider of the ore-stretch of Bjønsaasen hills parallel to Skrataas. The distance of the claim to the line of the long southern crosscut from the 2nd. level of Skrataas mine is 300 meters at least and the Bjønsaasen claim measured 280 meters to the east will not reach it.

The Bjønsaas mine itself, as said on page 8, is of little importance, certainly being the offshot of veins, but the claims right of 280 meters to the east might be of interest for Skrataas.

Negotiations have not till now been opened in order to secure this right for Skrataas mines. See map II and IV.

The Roktdal claims belong to the present mining captain at Skrataas Mr. Raaen and some of his friends, having been acquired before his special contract with Skrataas. The writer has not yet seen these occurrences and cannot therefore say anything about the eventual acquisition of the same by Skrataas, but, considered as reserves, it may be said, that the claims are situated rather far from existing communications. For all that the occurrences must be surveyed by a mining engineer.

Skrataas. The amount of annual production.

In order to render it possible to re-imburse the capital hitherto invested in the development work performed and in the maintenance of the mines - and further the eventual capital to be invested in further development and in plants and arrangements as for regular operation of the mine - it is of course of necessity to imply a minimum of annual ore production.

The expert Mr. Watteyne assumed in 1899 an annual production of 7000 tons dressed ore of prima ore-grade (33% Zn), and the expert Mr. Tricon (1900) assumes 10.000 tons of the same ore-grade (34% Zn), figures being converted into the hitherto produced cobbled 15% ore suited for dressing, represent respective 13.000. and 21.000. tons of such ore. An annum like that would consume the ore in-sight, hitherto developed during 2 or 3 years, and conditions therefore important developing work even down to a depth of 300 meters before regular operation can take place.

As said, however, the intension of this paper is to give an idea about the possibility of sinking a minimum of investment with a minimum of ore consumption. Perhaps would 10.000. tons of such cobbled - 15% - ore do it and bring the desired result, and upon this base are the below made calculations appeared.

The capital hitherto invested in the affair by the proprietors is nearly 335.000,00 Kr. = abt. 18.500. £., but they are willing to sell for Kr. 100.000,00 = 5500£. and this figure is included here. An other figure 358.000,00 Kr. = 19.700. £ should be required to cover the expences of plant construction and other arrangements necessary to regular operation. And in add to this comes the cost of development work being necessary to secure ore for say a 10-years period of re-imburse of capital invested encreasing it with 107.000,00 Kr. = abt. 5.800. £. The whole capital amounting to Kr. 565.000,00 = 31.000. £.

It appears, that an annual production of 9 000 tons of the 15%-grade ore at the low quotations of metals noted on page 14, should be able to pay the selfcost and freight and a 10% sinking of the capital invested a 10-years period.

As for the duration of ore-quantity a production of 10.000. tons of the said grade of ore will consume the present ore-in-sight during 3½ years, added with the probable ore: 5 years, the possible ore of category (I) added 9 or 10 years and of category (II) 18 years.

Developing and Researching work.

The levels hitherto driven only secure the ore production for $3\frac{1}{2}$ or mostly 5 years if the mine should be operated at an annual scale of 15.000 tons of raw ore = 10.000 tons of cobbled, 15% ore, and as the conclusions, mentioned above, of the whole experts, having examined the mine, has been the recommendation of further development of the deposit before one takes up with the erection of expensive plants &c. necessary to regular operation.

The plan is therefore to drive levels down to the double depth of that of the present, viz. 160 meters = abt. 500 feet vertically, which should secure the stipulated operation for abt. 10 years forward.

This developnig work surpose different machinery &c. to be set up to be able to finish the said work within reasonable time, viz.: transmission of electric power, transformation of the same, compressed-air system for the mining, bor-sharpener for the forge, shaft-winch &c. &c. further provinsiohal housebuilding and reparation of the road, representing a total cost of Kr. 73.000,00 = abt. 4000 £.

The working expences of this development of the mine based upon the said machinery are calculated to be abt. 90.000,00 Kr. = abt. 5000 £, further handwork in Marken mine and in the field - 17.000,00 Kr. = abt. 800 £, in all 107.000,00 Kr. = 5800 £. In details below:

In Skrataas mine.

The labour:

Rectilinearizing of the inclined shaft	26	cub. mtrs.
120 metrs. continuance of the inclined shaft in the depth		
6 cub. mtr. per running mtr.....	720	" "
On level 2: 38 mtr. gallery of 3 cub. mtr. per mtr.	114	" "
On levels 3,4 & 5: 320 mtr. gallery of 3 cub. mtrs. per mtr.....	960	" "
Airsinks between the levels, se map Nr. VI: 3 . 42 of 5 cub.m....	6300	" "
In all	2500	cub. mtrs.

See map VI.

A miners 8-hours day-work by using pneumatic tool should be abt. 0,75 cub. mtrs. in gallery or sink, delivering the ore at transporting shaft. Thus the stipulated 2500 cub. mtrs. should be worked by 10 miners in 3300 day-work, i.e. by 2-shift in 165 days = 7 months. The expenses should count to Kr. 1,00 per hour = Kr. 8,00 per day-work - 165 . 10 . 8 = Kr. 26.400,00 or Kr. 10,60 per cub. mtr. The materials should come to abt. Kr. 8,00 per cub. mtr., the per cub. mtr. in all thus: Kr. 18,60, and 2500 cub. mtrs. Kr. 46.500,00.

By contract ^{should} the miners will earn more than Kr. 1,00 per hour, but in return the work ^{should} be finished in shorter time than 7 months.

The developing work and its preparatory labours have to be performed successively as follows: If begun in april 1928 the construction work should last 5 months and the development work begun in September should be finished after 7 months in april 1929.

Estimated cost of 12 months:

Kr. Kr.

1. Constructions 5 months.

Transmission of power 1700 mtrs. includ.		
expropriation of ground	5000,00	
Transformer-station for 300 kw.	3000,00	
Sundry installations	2000,00	
Air-compressor &c.	8700,00	
6 hammers &c.	4300,00	
Bor-sharpener and furniture of forge	3000,00	
Hoisting engine &c., tramway & Pump &c.&c..	21000,00	
Sundry transports, erection of machinery &c.	6000,00	
Privisional buildings	10000,00	
Contingencies, 15%	10000,00	73.000,00
Transport		73.000,00

Kr.

Kr.

	Transport	73.000,00	
2. Administration for 12 months		15.000,00	
3. Development work 7 months.			
Boring incl. materials and hauling	46.500,00		
Hoisting 2 men and 2 men in the shaft	6.500,00		
Power 80 HP of Kr. 80 per HP-year in 7 months ..	3.700,00		
Cobbing & transp. to heap 6 men, 1 foreman	10.000,00		
Sundry materials, contingencies	4.800,00		
Mining Captain	3.500,00	75.000,00	
4. Hand-boring in Marken mine, 12 months.			
Work: 60 metres. gallery &c. = 180 cub. mtrs.			
2 miners & 1 by transport, 180 , 55,00	12.000,00		
5. Researches in the field 6 months.			
2 men and materials	5.000,00	17.000,00	
	<u>Totally</u>	<u>180.000,00</u>	

As for the eventual result of the development work thus performed two alternatives should be taken in reflection:

Alt. 1.

The development having turned out according to the supposition, should immediately occasion the next matter: the construction of dressing plant &c. The platform and calculations of the same will be detailed below.

Preliminary the economic situation is the following:

There exist complete arrangements for modern rational operation of the mine, as for the very mining and conveyance section, the cost of which having amounted to Kr. 73.000,00. The amount of raw-ore worked during the 7 developing months is 2500 cub. mtrs., which by hand-picking certainly have given even so much cobbled ore as the former development work, viz.: 1 ton per cub. mtr. totally worked, accordingly then 2500 tons of 15% ore. The usable quantity of older stored ore, second sort and smalls (the latter having been heaped on the bank of the Stammyr lakelet) shouldn't be more than abt. 2500 tons, containing abt. 11,5% Zn. In all should exist abt. 5000 tons of cobbled ore of abt. 13% Zn - goods suited for dressing and sufficient for half a years plant operation, the worked quantity from Marken Mine not included.

The whole c.i.f.- value of this quantity sold as concentrates at present quotations should be Kr. 45,00 per ton, the self-cost expect mining & cobbing Kr. 25,00, insurance & freight included, and the value thus Kr. 20,00 per ton - 5000 tons = kr. 100.000,00.

Alt. 2.

Granted secondly, that the development of the mine should be more complicated than that being formerly driven, and the stipulated space of duration therefore must fail - it should be necessary to encrease the work and prolong its duration, the cost of which coming in add to the noted amount.

Experienced from the former development, this eventuality shouldn't occasion more risk than abt. 35%, encreasing the cost of development from Kr. 107.000,00 to 142.000,00, the difference being Kr. 35.000,00.

Joint - stock Company.

The financial basis of the Skrataas affair should be a joint-stock company possibly composed of the present mine proprietors and the eventual financiers. The nominal seat of such company must be in Norway.

The joint stock should consist in:

1. The value of the mines i.e. the amount of capital hitherto invested as for purchase and development, the interest being a matter of the future. Till now this capital amounts to Kr. 335.000,00, however, the mine is proposed to be sold for Kr. 100.000,00.
2. The amount, being sufficient for the further development of the mines and for the construction of the arrangements being necessary for the rational performance of this development and for the regular operation of the mine. This capital should amount to Kr. 500.000,00.
3. The third factor is the trading capital, say for 6 months of regular operation. Perhaps it may be produced by means of cash credit with security on the constructed works &c. &c.

Consequently, the joint-stock capital should amount to:

	Kr.	£.
The proprietors investment from 1902-1928,		
represented by the mines	100.000,00	5.500
New development work	107.000,00	
+ 33% risk of duration	35.000,00	
Construction of plants &c.&c....	358.000,00	500.000,00
Trading capital for 6 months	230.000,00	12.500
<u>Totally:</u>	<u>830.000,00</u>	<u>45.500</u>

The continuance of re-imburse.

The affair of Skrataas being temporary-planned for the operation of a single mine, conditions a return of the capital invested during a minimum of time, however, difficult to reduce to less than 10 years. Certainly it must be said to be a reasonable supposition, re the above stated facts, that the occurrence has a much greater extension in the dip, and perhaps a real success of the proposed development work should occasion another figure set up.

The real joint-stock capital to be sinked annually exempt from taxation is Kr. 100.000,00 + Kr. 500.000,00 = 600.000,00 or abt. 32.000. Lst.

As for the trading capital this is free capital and must be returned and paid interest on as generally.

About Construction and Regular operation of the mine.1. In the mine.

An annual production of 10.000 tons of cobbled ore equals hewers work of 5000 cub. mtrs. raw ore (= 15.000 tons). This work should be done by 12 miners, 8 at the stoping work and 4 driving levels. The annual result of the miners work at Kongsberg Silver-Works for 2 years has been respective 486 and 534 cub. mtrs.

Supposing the lowest figure for Skrataas, the miners work should be distributed as follows:

4 hands working	0,75 cub.mtrs. a day	by driving levels	= 3,0 cub. mtrs.
8 " " "	2,25 " " " "	stoping work	= 18,0 " "
<u>12 hands working</u>	<u>1,75 cub.mtrs. a day</u>		<u>= 21,0 cub. mtrs.</u>

During 280 days this 21 cub. mtrs. a day will amount to 5880 cub. mtrs. The proportion between the miners hewing work and haulage at Kongsberg Mines has been about 3,2 : 1.

The average contract of gallery driving being put to Kr. 18,00 per cub. mtr. the stoping work should cost one third of that or. Kr. 6,00, the average then Kr. 10,00 per cub. mtr. and the total annual cost of the very mining = $5880 \cdot 10 =$ Kr. 58.800,00. The power required for 6 hammers should amount to HP = abt. 45 kw of Kr. 100,00 per kw-year + up-keep = Kr. 5000,00.

The other expenses of the very mine should be the drainage, the timbering, the hoisting and the ventilation.

As for the drainage the rush of water is little - about 30 minute -liters = $6\frac{1}{2}$ gallon per minute. The greater part of the water comes from the long crosscut to the south, which passes under the Stammyr lakelet. An emptying arrangement combined with the hoisting work in the inclined shaft might keep the mine dry. Otherwise a centrifugal pump for say 200 metres. pressure will do it. The power required should be 15 HP = 10 kw. of Kr. 100 per kw-year = Kr. 1000,00. Maintenance and management should amount to abt. Kr. 3000,00 a year.

As for the timbering may be said, that the precipitous dip of the occurrence - 62° - suggests the mine to be worked with filled stopes. When the stores successive are emptied, the open width must be timbered although some pillars may be left where the ore-lences alternate, especially between the two main net of veins - the Fund mine and the Big mine. The annual working of abt. 5000 cub. mtrs. of the mineralized stretches occasion 5000 = 20 meters annual sinking of the ore area, further should an average

width of nearly $3\frac{1}{2}$ metres. = abt. 10 feet necessitate 100 props mostly, a cost of abt. Kr. 1000,00. Further come the different floorings of sinks &c. and sundry stages, maintenance of the transporting shaft &c. &c. The timbering should be performed by 3 carpenters paid Kr. 2400,00 a year, and the total timbering cost should amount to :

Wages	Kr. 7.200,00
Materials and tool	" 2.800,00
Totally	Kr. 10.000,00

As for the transport of raw-ore the following details should be observed: The whole quantity to be transported out of the mine during one year amounts to 5880 . 3 = abt. 18.000 tons, i.e. in 280 shifts or 64 ton in one shift = 8 tons per hour.

The hauling work by driving levels should be included in the miners contract. The trimming of goods anywhere in the mine should employ 2 hands. The conveyance of raw-ore from the stores to the shaft-pockets should employ 2 hands with 2 waggons.

The pocket-emptying into the shaft-tubs should task 2 hands.

The shaft-hoistings along the 38 degrees inclinal, supposes a double system of rail transport and a hoisting machinery for 160 mtrs. vertical depth or 225 mtrs. along the incline, requiring 30 HP. The best way should be to place the winch in the dressing plant intending to deliver the ore directly into the pockets of the cobbing section. The care of the hoisting machinery should be taken by 2 hands and the emptying of the ore into the pockets should be performed automatically. The hoisting expenses should amount to:

Number of hands 8 of Kr. 2400,00	= Kr. 19.200,00
Power 30 HP = 23 kw of Kr. 100	
+ up-keep	= " 2.600,00
Up-keep of the furniture along the transportway	= " 3.200,00
Totally:	Kr. 25.000,00

Price of Electric Power.

The price of electric power has been put to abt. 100,00 Kr. per kw-year. The commune has a contract with Follafooss power-station and is willing to deliver the current close up to the mine and transform it there for a price of Kr. 106 per kw-year during a 10-years period, but may perhaps reduce to Kr. 100,00. Certainly an interim-contract should be made at first for say 80-90 kw. according to the plan of a previous development work.

Kr.

The total mining cost annually amounts to:

The mining itself.....	Kr. 58.000,00	
Power for the compressor	" 5.000,00	
Up-keep of hammers and tubes	" 3.200,00	67.000,00
The drainage		4.000,00
The timbering		10.000,00
The transport out of the mine to Plant		25.000,00
Contingencies		14.000,00
	<u>Totally:</u>	<u>120.000,00</u>

or Kr. 12,00 per ton of cobbled ore.

2. In the dressing Plant.

As for the cobbing work a maximum of 64 tons of raw-ore have to be hand-picked per day, i.e. during 8 hours, the heavy peaces upon floor, the smaller after the first crushing upon belt-conveyer. The products should be 35 tons of wash-ore and 29 tons of waste rock. Assuming that one hand can sort out 5 tons waste rock per shift, normal = 8 hours, this cobbing work should be performed by 6 hands + 2 hands at the trimming.

The cobbing cost should therefore amount to Kr. 20.000,00 annually, viz.: 6 labourers of Kr. 2400 a year Kr. 14.400,00
2 boys " " 1800 " " " 3.600,00
Tool &c. " 2.000,00
Totally Kr. 20.000,00

or Kr. 2,00 per ton of cobbled ore.

The dressing plant should consist in 4 sections, one of them, the cobbing, just dealt with, the second is the crushing station, the third the shaking tables or vanners and the fourth the flotation departement.

The original ore for dressing should be 35 tons ore of 15% Zn, i.e. 4½ tons per hour.

The crushing station should be furnished with 2 Hadfields crushers, 1 24x16" of 25 HP, price Kr. 12.000,00, and 1 16x11" of 20HP, price Kr. 8000,00, 2 intermediary crushers, Symons dish or spindels of 24", 15 HP, price with reserves for 2 machines Kr. 16.000,00, 2 ball-mills for 6 tons per hour of the Grøndal type, 50 HP, price for 2 pieces Kr. 20.000,00, 1 tube mill for quartzite-linings and flint-balls, production 3 tons per hour, 30 HP, price Kr. 8000,00. In all installations for Kr. 64.000,00 requiring 135 or 140 HP. = abt. 100 kw.

The dressing system might be the following:

The ore crushed down by passage through the mentioned 2 stone-crushers and 1 Symons dish reaches the ball-mill. This ball-mill should be of the type without screen-arrangement, while it in return should co-operate with a hydraulic classifier and 3 vanners, from which the tailings by pumping should return to the ball-mill or to a tube mill. The finegrained overflow from the classifier should pass a thickening-tank and sufficient un-watered be conveyed to the flotation departement, the "Callow" cells. The said being the main passage, in add should come the arrangement for intermediary products requiring a double system of hydraulic classifiers and Callow cells &c. &c.

The flotation product requires a filter arrangement, hydraulic or vacuum.

All this machinery requires but little carehold, while the expenses of the maintenance are rather important. Based upon the above quoted details and Experience from similar plants being in operation, the expences of the dressing of Skrataas ore should amount to:

Kr.

Annual expences of the dressing:

1 foreman & 9 labourers, 3400 & 2400 Kr.....	25.000,00
Reparations, 4 labourers of 2800 Kr.	11.200,00
Sundries..... 2 hands	4.800,00
Power for the crushing 100 kw. of Kr. 100,00 per kw-year + up-keep	11.300,00

Power for the dressing:

The pumps 37 HP, the vanners 10 HP, the blower for the pneumatical cells &c. 50 HP, for the conveyers 10 HP, and for the thickening tank and diaphragma pump 5 HP, in all 112 HP = 82½ kw. 9.200,00

Materials: Linings for the crushers &c. Kr. 11.000

Iron & plates &c.....	2.000
Transmission weels, belts &c."	4.000
Sundries	4.000
Oils &c.	3.500
Fuel	4.000
Sundry transports and contin-	

gencies .. " 5.000 33.500,00

Totally 95.000,00

or Kr. 9,50 per ton.

The watering.

The dressing plant requires 66 sec.- liter water = 4000 liters per minute or 2000 cub. mtrs. per 8 hours. Of this quantity may 2/3 circulate and the absolute requirement of water thus amounts to 700 cub. mtrs. in 8 hours. Further requires water for the pneumatic hammers. A pump-station is necessary as no presswater exist.

The Stannyr brook doesn't always carry sufficient water, especially during July and February, and an embankment of the lakelet necessitates. A dam of 2 metres. = 6½ feet should encrease the surface from 4800 to 11300 square mtrs. The average area at 2 mtrs. elevation is surveyed to be 9300 sq. mtrs. and the full reservoir thus contain 20.000 cub. mtrs. sufficient for 30 days. Even an embankment up to 3 mtrs. elevation is possible and should secure the dressing plant for two months.

The materials to this embankment might be produced from the present heap of waste rock, tightened with moss, and it should serve as a bridge for the repaved road crossing the brook. See map IV.

The waste rock and the Tailings.

The waste rock should be heaped to the east along the slope, transported by 2 hands - noted under the dressing plant, - or perhaps later on mechanically. It is wanted to treat 5-7000 tons a year.

The tailings from the dressing plant, amounting to abt. 6000 tons a year should follow the brook-course or, if necessary, be transported to heap.

The buildings.

Among the house-buildings required the dressing plant is the most important and should be placed in the northern slope of the brook-course close up to the incined shaft in order to let this shaft linearly continue directly into the upper floor of the building just over the cobbing department. The plant should cover 500 square meters and consist in 3 floors, its total cost builded of wooden materials and with concrete foundations should amount to Kr. 47.000,00 + 10%.

The other buildings required is the forge and the working shop, further the joiners shop and a building for office and the labourers dressing and dining rooms, the cost of which should amount to respective 10.000,00, 3000,00 and 14.000,00 Kr.

The forge should be furnished with a pneumatic bor-sharpener, the working shop especially with ~~xxx~~ a late and bor- and cutmachines, the joiners shop with a mechanical driven saw, inn all at a cost of abt. Kr. 6000,00. In the forge 1 smith and a boy, in the working shop 1 electrician and 3 mechanics - 2 of them noted under the dressing plant, in the joiners shop 2 or 3 labourers - 2 noted under the dressing plant.

On the office 1 book-keeper, 1 clerk and cash-keeper and 1 office girl. 3 hands for sundries, 2 of them noted under the dressing plant.

The duration of the construction time.

The development work of the Skrataas mine having been finished succesfully in april 1929, the construction of the dressing plant &c. should begin immediately, prepared of course at once the real continuance of the veins in the dip has been evident enough. And the construction should last 1½ or 2 years mostly.

How far it should be of interest to continue the development of the Skrataas mine or at least the Marken mine and the claims during the construction time, could be a matter of discussion. For all that - the regular operation should take place from april 1931.

Register of Construction costs &c.

-approximative-

		Kr.
<u>In the mine.</u>	Repair of the road, 2300 running mtrs. of Kr. 7	16.000,00
	Transmission of electric current, Transformer-station, electrical installations of any kind	8.000,00
	Telephone	2.000,00
	Air compressor plant &c.&c.	13.000,00
	Hoisting arrangement for the shaft	21.000,00
<u>In the plant.</u>	Furniture of forge, working- and joiners shops	6.000,00
	The crushing machines	64.000,00
	Electric motors	6.000,00
	Blower for the Gallow cells &c.	4.000,00
	Sundry conveyers	7.000,00
	3 shaking-tables	4.000,00
	2 Gallow cells	7.000,00
	Thickening tank arrangement and Filterpress	18.000,00
	Sundry transmissions, belts &c.&c. mounting, frights	28.000,00
	Building for dressing plant	47.000,00
<u>Buildings</u> &c. see map IV.	" " forge and working shop, joiners shop ..	13.000,00
	" " office &c.	14.000,00
	Apparate for heating	8.000,00
	Administration during the construction period	23.000,00
	10% Contingencies	38.000,00
Totally: Kr. 339.000,00		342.000,00
In add comes expropriation of ground:		
say - 500.000 square meters of Kr. 10,00 and 10.000 sq.m.		
of Kr. 100,00		6.000,00
Dam , embankment of the Stammyr lakelet		4.000,00
Pumping station in the dressing plant		6.000,00
The cost of the development work till april 1929		142.000,00
Totally: Kr. 500.000,00		

Packing & Freight of Concentrates to c.i.f.-Harbour.

Packing 12 bags of 0,25 Kr. per metr. ton, 60% retur	Kr. 1,50
Automobile-transport from the mine to Store at the railway- station Sunnan	" 2,00
Lading into railway-waggon	" 0,70
Railway-transport & forwarding to f.o.b.-steamer Hommelviken .	" 6,00
Freight from Hommelviken to Antwerp	" 11,00
Insurance	" 0,30
Totally:	Kr. 21,50

Number of Hands at full Operation.

In the mine:

1 foreman of Kr. 3600 per year	Kr. 3.600,00
12 miners " " 2800 " "	" 33.600,00
3 carpenters " 2400 " "	" 7.200,00
8 transport of " " " "	" 19.200,00

In the plant:

6 by cobbing " 2400 " "	" 14.400,00
2 " " " 1800 " "	" 3.600,00
9 in the dressing plant of 2400 " "	" 21.600,00
1 foreman " 3400, " "	" 3.400,00
4 mechanics " 2800 " "	" 11.200,00
3 joiners " 2800 " "	" 8.400,00
2 sundries " 2400 " "	" 4.800,00
1 " " 1800 " "	" 1.800,00
Contingencies	" 4.600,00

52 labourers of 2600 Kr. per year Kr. 137.400,00

In the office:

1 book-keeper	of Kr. 5000,00 per year
1 clerk and cash-keeper	" " 3600,00 " "
1 office-girl	" " 1800,00 " "
3	Kr. 10400,00 per year

At the mine: 1 superintendant, mining captain, Kr. 6000,00
To take care of the affair in Norway 1 superintendant,
mining engineer, paid Kr. 4 or 5000,00 Kr. per year.

Electric power required as follows:

In the mine: 1 air compressor	60 HP.
1 pump 200 m. press. 120 min.l. ...	15 "
1 300 mtrs. hoisting engine	30 "
In the plant: 1 crusher 24x16	25 "
1 " 16x11	20 "
1 dish " 24"	15 "
1 ball mill 6 tons	50 "
1 tube mill 3-4 tons	30 "
1 pump	12 "
1 " 20 mtrs. press	25 "
3 tables	10 "
1 blower for Callows	50 "
1 pump	12 "
1 thickening tank and diaphragma- pump ..	5 "
Conveyers	10 "
Electric light	15 "
Working-shop	5 "
Reserves	11 "
Totally	400 HP = 300 kw.

The annual Working Expenses.

Calculated per ton of Cobbed Ore-15% Zn- 10.000. tons annually.

1. 52 labourers, foremen included, of averagely ca. 2650 kr. ...	Kr. 137.400,00
2. Materials and transport of the same	" 82.000,00
3. Labourers insurance and sick-klub	" 3.600,00
4. Electric power, 300 kw. of kr. 100 per kw-year + up-keep	" 34.000,00
5. Royalty of claims, 40 a kr. 15,00	" 600,00
6. Rayalty of concession	" 2.000,00
7. Administration and Office	" 30.000,00
8. Fire Insurance 5% of kr. 365.000,00	" 1.825,00
9. Sundries and Contingencies 5 % of the self-cost	" 15.075,00
10. Annual sinking of the joint-stock capital 10% of kr.600.000	" 60.000,00
11. Packing and freight to c.i.f.- harbour of abt. 4000 tons of concentrates, containing 7% wet, kr. 21,50 per ton	" 86.000,00
Totally:	Kr. 452.500,00

c.i.f.-value of sale products kr. 133,11 . 3700 = " 492.500,00

Net income Kr. 40.000,00

12. To place annually to the reserve fund during 10 years kr. 4000,00	
13. Interest of the Trading Capital, 2% of kr. 226.000,00 " 4500,00	" 8.500,00
Difference @ which taxes should be calculated	Kr. 31.500,00

14. The taxes:

Land tax of the mines and plants, to the county kr. 5,00 per "skyldmark", 119 . 5	Kr. 595,00
" " commune " 4,00 " " 119 . 4	" 476,00
Ordinary cammunal rates 15% of income, extraordinary 10% increase of the sum, kr. 31.500,00 thus raised to 34.150,00 . 15%	" 5197,50
Of fortune 4/1000 of kr. 600.000,00	" 2400,00
Fiscal tax 6% of income, ordinary of 31.500,00	" 1890,00
" " 2/1000 of fortune	" 1200,00
" " of funds 10% of income not dealt with to the shareholders, viz: the annual placement for the reser- ve fund and all the taxes, totally kr. 17.515,00	" 1751,00
Taxes totally	Kr. 13500,00

Net benefit: Kr. 31.500,00
 + " 13.500,00

 Kr. 18.000,00

Reduction of wages, however, is before abt. 4% per primo May, and as gold-redeption has now been resolved, it should be quite secure to reckon with further reductions of wages within 2 years, say down to kr. 2400,00 at least, i.e. 10% lower than present level used here. Likewise is secure to reckon with similar decrease of prices of materials and cost of freight, and the heads No. 1,2,7,9 and 11, amounting to kr. 350.000,00 should be lowered 10%. Therefore, the net benefit will go up from kr. 18.000,00 to kr.34.000,00, a figure, which should be used in order to illustrate the retability of the Skrataas mine during a 10-years period.

22
C A L C U L A T I O N No. 1.

of the Rentability of a 10-Years sinking Period for the Development and Construction Capital of SKRATAAS MINE being the Basis of the economical Zifres of the Report

Capital to be sunked during 10 Years kr. 600.000,00

Annual Instalment thus kr. 60.000,00

Net Benefit annually kr. 22.000,00 of which annually kr. 4000,00 should be laid aside for ReserveCapital, the rest kr. 18.000,00.

There is reckoned 5% interest of the said 600.000,00 and so of the annual Deficit of the Affair thereby following viz.:

1. 5% interest of 600.000,00 kr.	kr. 30.000,00	
Net benefit kr. 22.000,00 - kr. 4000,00 to the Reserve Capital =		÷ " 18.000,00
	1. Deficit	kr. 12.000,00
2. 5% interest of 540.000,00 kr.	÷ " 27.000,00	
5% " " the Deficit 1.	÷ " 600,00	
		kr. 39.600,00
Net benefit kr. 18.000,00 + 5% interest of kt. 4000,00 = kr. 18.200,00		÷ " 18.200,00
	2. Deficit	kr. 21.400,00
3. 5% interest of kr. 480.000,00	÷ " 24.200,00	
5% " " the Deficit 2.	÷ " 1.070,00	
		kr. 46.670,00
Net benefit kr. 18.000,00 + 5% interest of kr. 8000,00	÷ " 18.400,00	
	3. Deficit	kr. 28.270,00
4. 5% interest of kr. 420.000,00	÷ " 21.000,00	
5% " " the Deficit 3.	÷ " 1.413,00	
		kr. 50.683,00
Net benefit kr. 18.000,00 + 5% interest of kr. 12.000,00	÷ " 18.600,00	
	4. Deficit	kr. 32.083,00
5. 5% interest of kr. 360.000,00	÷ " 18.000,00	
5% " " the Deficit 4.	÷ " 1.604,00	
		kr. 51.687,00
Net benefit kr. 18.000,00 + 5% interest of kr. 16.000,00	÷ " 18.800,00	
	5. Deficit	kr. 32.887,00
6. 5% interest of kr. 300.000,00	÷ " 15.000,00	
5% " " the Deficit 5.	÷ " 1.644,00	
		kr. 49.531,00
Net benefit kr. 18.000,00 + 5% interest of kr. 20.000,00	÷ " 19.000,00	
	6. Deficit	kr. 30.531,00
7. 5% interest of kr. 240.000,00	÷ " 12.000,00	
5% " " the Deficit 6.	÷ " 1.527,00	
		kr. 44.058,00
Net benefit kr. 18.000,00 + 5% interest of kr. 24.000,00	÷ " 19.200,00	
	7. Deficit	kr. 24.858,00
8. 5% interest of kr. 180.000,00	÷ " 9.000,00	
5% " " the Deficit 7.	÷ " 1.443,00	
		kr. 35.301,00
Net benefit kr. 18.000,00 + 5% interest of kr. 28.000,00	÷ " 19.400,00	
Transport:	8. Deficit	kr. 15.901,00

	Transport		kr. 15.901,00
9. 5% interest of kr. 120.000,00	+	" 6.000,00
5 % " " hte Deficit 8.		+	" 795,00
			<hr/> kr. 22.696,00
Net benefit kr.18.000,00 + 5% interest of kr.32.000,00 ÷			" 19.600,00
	9. Deficit		<hr/> kr. 3.096,00
10. 5% interest of kr. 60.000,00	+	" 3.000,00
5% " " the Deficit 9.		+	" 155,00
			<hr/> kr. 6.251,00
Net benefit kr.18.000,00 + 5% interest of kr.36.000,00 ÷			" 19.800,00
The Capitals sinking completed, net			<hr/> <hr/> kr. 13.549,00

During 10 years the Capital kr. 600.000,00 might be sinked and paid 5% Interest of and moreover the 10 years give a net benefit of kr. 13.549,00. In add comes the Reserve Capital amounting to kr. 40.000,00, having been laid aside of the annual profit.

The Construction and operation calculations of Mr. Støren refer to the proportions of 1927 in Norway and of almost minimal quotations of metals. Within 2 or 3 years the former must go down certainly 20 or 25%, the latter probably rise, 25 £ for Zinc and 20 £ for Lead has been considered the possible minimum this time.

It is said, that "Metalbank", Frankfurt, supposes £ 25 per ton of fine Zinc to be the lowest quotation possible during this baisse. At present the Zinc market is glutted, but for all that, argentiferous zinc-lead ores should always find buyers.

29.
C A L C U L A T I O N No.2.

of the rentability of a 10-years sinking period of the capital invested
viz. kr. 600.000,00, assuming an annual net benefit of kr. 34.000,00.

1.	5% interest of kr. 600.000,00	kr.	30.000,00
	+ net benefit 1	"	34.000,00
		Real net 1.	kr. 4.000,00
2.	5% interest of kr. 540.000,00	kr.	27.000,00
	+ net benefit 2: kr. 34.000,00		
	5% interest- " 200,00 of the reserve fund kr.4000.		
	Real net 1. " 4.000,00	"	38.200,00
		kr.	11.200,00
3.	5% interest of kr. 480.000,00	kr.	24.000,00
	+ net benefit 3: kr. 34.000,00		
	5% interest- " 400,00 of kr. 8000.		
	Real net " 11.200,00	"	45.600,00
		kr.	21.600,00
4.	5% interest of kr. 420.000,00	kr.	21.000,00
	+ net benefit 4: kr. 34.000,00		
	5% interest- " 600,00 of kr. 12.000.		
	Real net " 21.600,00	"	56.200,00
		kr.	35.200,00
5.	5% interest of kr. 360.000,00	kr.	18.000,00
	+ net benefit 5: kr. 34.000,00		
	5% interest- " 800,00 of kr. 16.000.		
	Real net " 35.200,00	"	70.000,00
		kr.	52.000,00
6.	5% interest of kr. 300.000,00	kr.	15.000,00
	+ net benefit 6: kr. 34.000,00		
	5% interest- " 1.000,00 of kr. 20.000.		
	Real net " 52.000,00	"	87.000,00
		kr.	72.000,00
7.	5% interest of kr. 240.000,00	kr.	12.000,00
	+ net benefit 7: kr. 34.000,00		
	5% interest- " 1.200,00 of kr. 24.000.		
	Real net " 72.000,00	"	107.200,00
		kr.	95.200,00
8.	5% interest of kr. 180.000,00	kr.	9.000,00
	+ net benefit 8: kr. 34.000,00		
	5% interest- " 1.400,00 of kr. 28.000.		
	Real net " 95.200,00	"	130.600,00
		kr.	121.600,00
9.	5% interest of kr. 120.000,00	kr.	6.000,00
	+ net benefit 9: kr. 34.000,00		
	5% interest- " 1.600,00 of kr. 32.000,00		
	Real net " 121.600,00	"	157.200,00
		kr.	151.200,00
10.	5% interest of kr. 60.000,00	kr.	3.000,00
	+ net benefit 10. kr. 34.000,00		
	5% interest- " 1.800,00 of kr. 36.000.		
	Real net " 151.200,00	"	187.000,00
		kr.	184.000,00

The end of the sinking period, having paid 5% interest of the capital invested, set aside kr. 40.000,00 as reserve fund and - totally got a real benefit of kr. 184.000,00 during 20 years operation.

Register of Enclosed Maps:

- | | | |
|------|--|------------------|
| I. | Map of central Norway, | scale 1:500.000. |
| II. | Map of Steinkjer-Snaasen, | scale 1:100.000. |
| III. | Geological Map of Steinkjer-Snaasen, | scale 1:100.000. |
| IV. | Map of Skrataas Mine-Field, | scale 1:1000. |
| V. | " " Marken | " " " " |
| VI. | " " Skrataas Mine, proposed development, | scale 1:500. |
| VII. | " " Marken | " " " " |

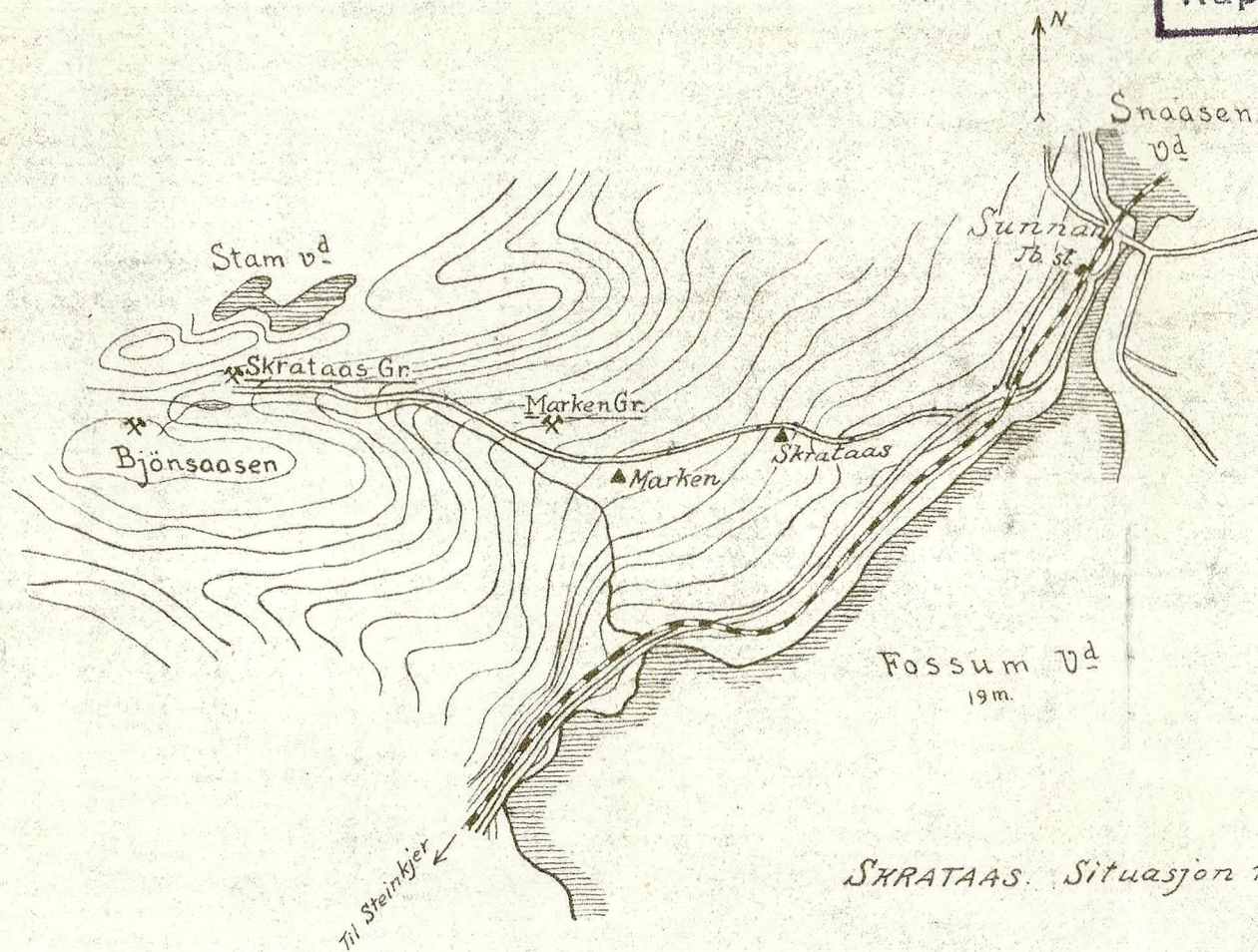
1878

N

ogiske Undersøkelse

Bergarkivet

Rapport nr.: 12401



SKRATAAS. Situasjon 1:25000.

1504

SKRATAAS ZINC & LEAD MINES

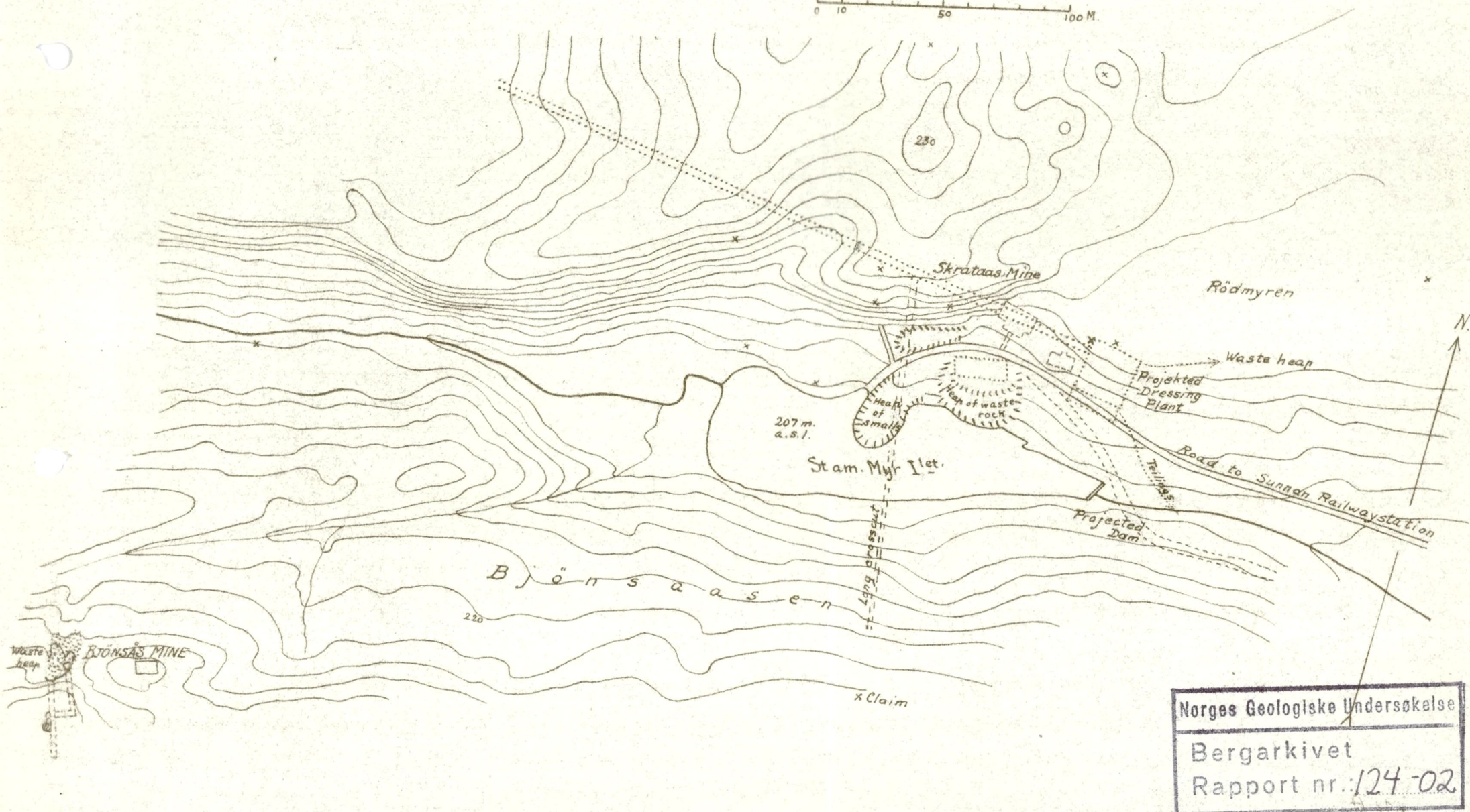
in Norway

Scale 1:2000

Equidist. 2 mtr.

Claim x

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Norges Geologiske Undersøkelse

Bergarkivet

Rapport nr. 124-02



Geologisk profil Fosnes - Skjækerdalen

Gneissbergart	
Eruptiver	
Kalksten	
Kvartsit	
Malmforekomst	
Fyllitisk skifer	

Norges Geologiske Undersøkelse
Bergarkivet
Rapport nr.: 124-03

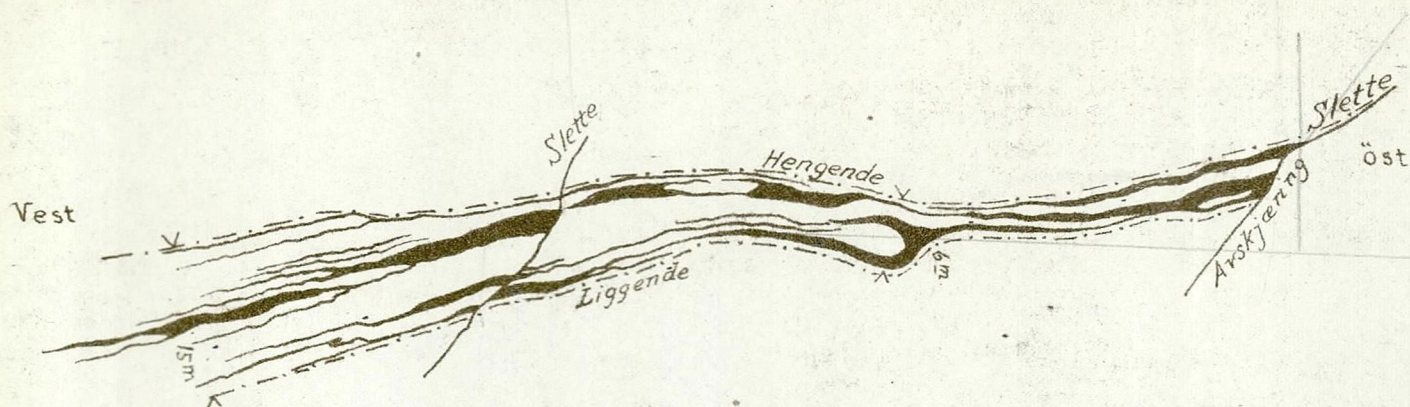
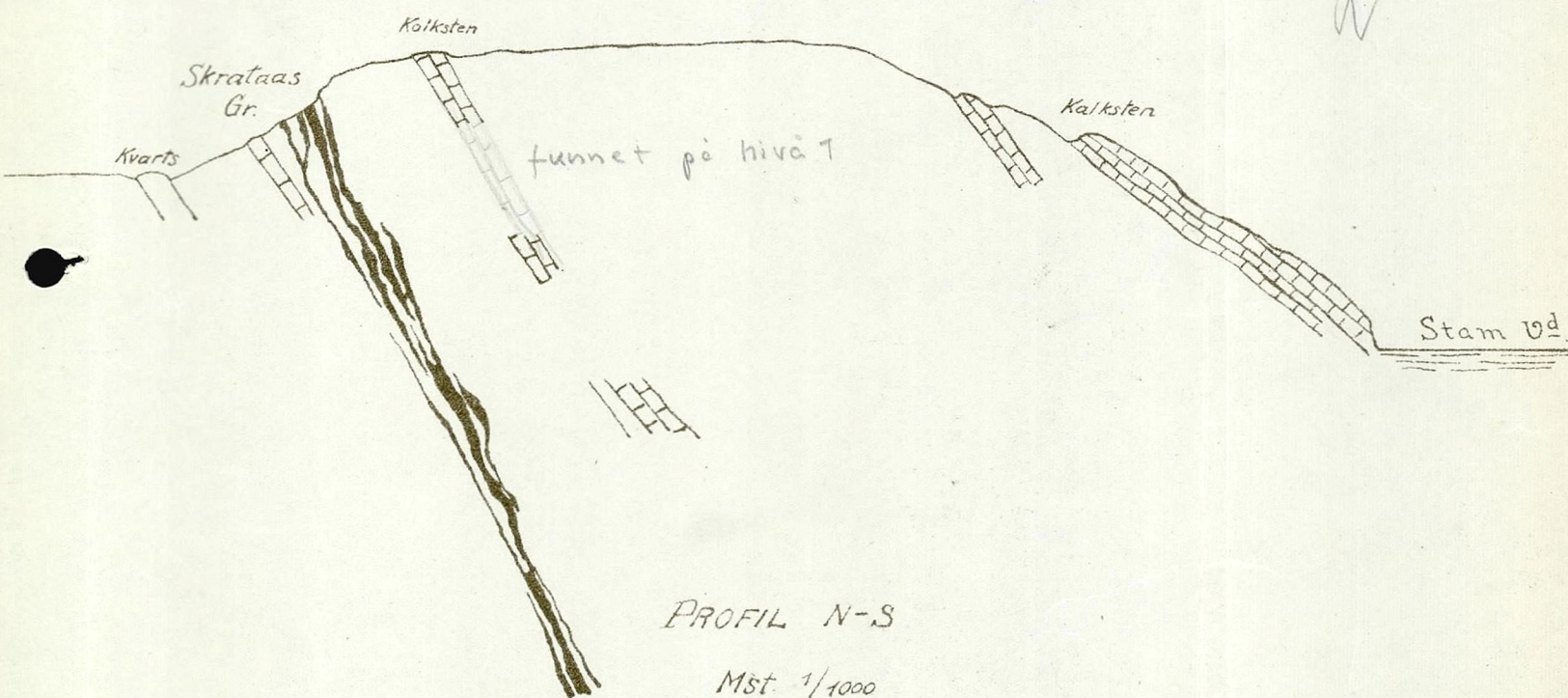
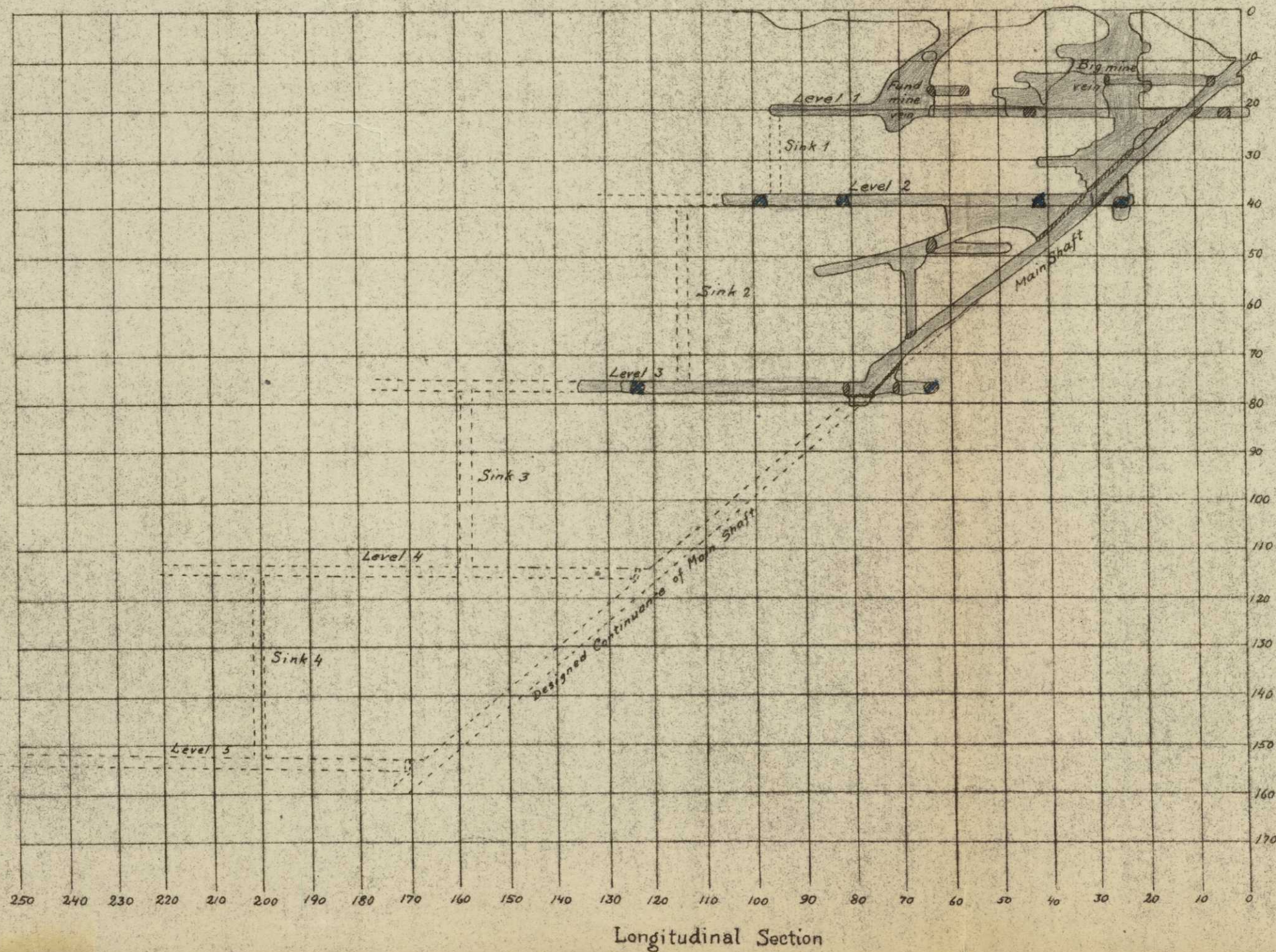
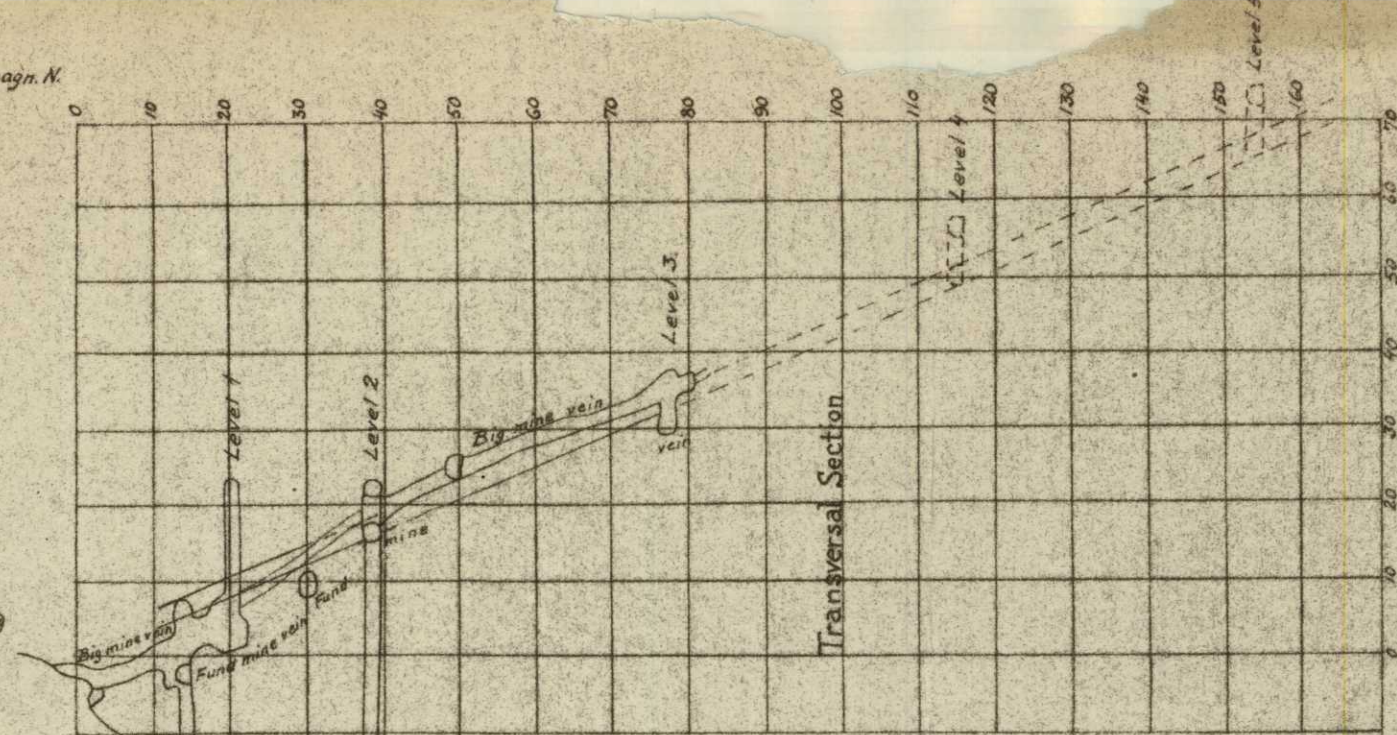
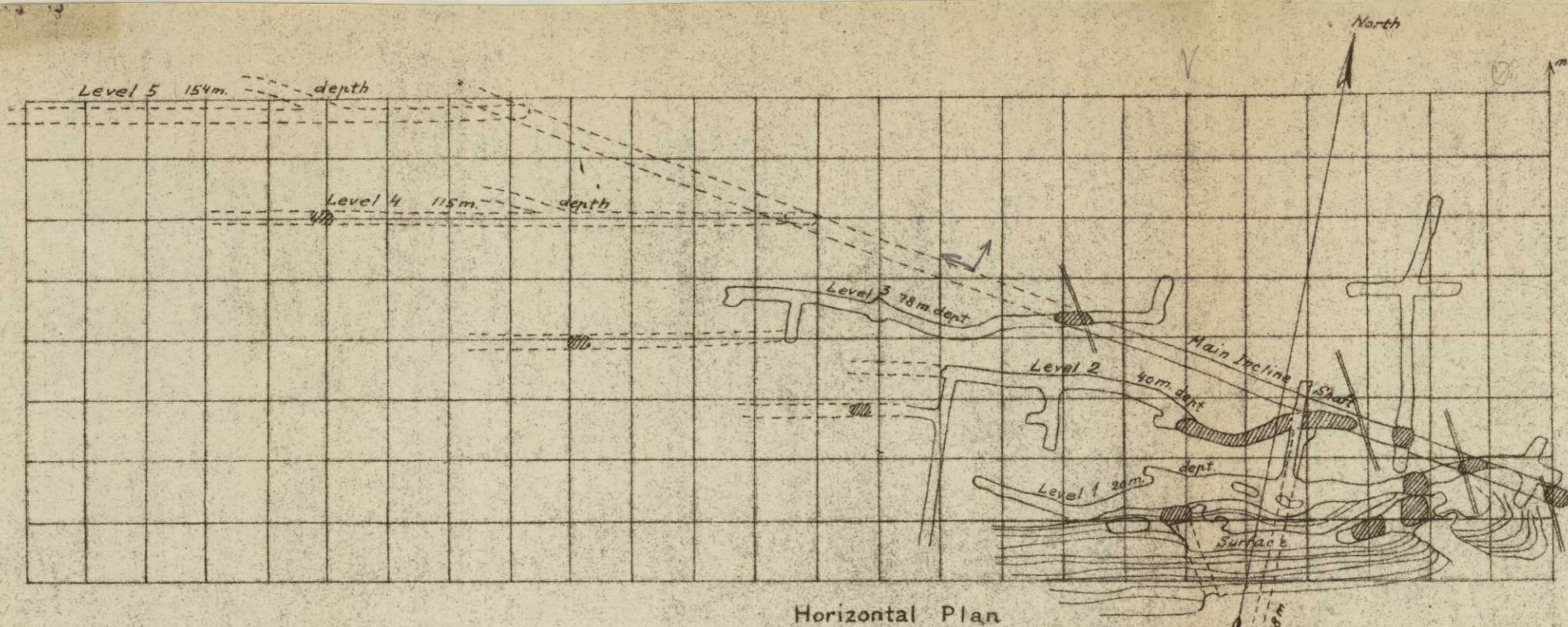


Fig 2. SKRATAAS GR. Ertzlegemet.





Norges Geologiske Undersøkelse
Bergarkivet
Rapport nr. 124-05

SKRATAAS MINE NORWAY Map of planned Development work

Scale 1: 1000
 — Levels hitherto driven
 - - - planned 1927
 --- Ore veins in sight
 --- " " probable
 --- Limestone
 --- Disturbance

after R.St. 1927.