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C O N S T R U C T I O N M A T E R I A L S

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C R I M E A A N D N . W . C A U C A S U S

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C e m e n t limestones in Caucasus
.....

These natural cement limestones are developed along the Black See shore from town Noworossijsk in the north, till Sochi in the south.

The reserves of these limestones are measured by millions tonnes and the exploitation of the layers is easy and is produced by the open quarries (Carriers).

The silicious cement limestones are interbedded with marls and sandstones in form of permanent alternation.

This complex represents the lower part of mighty series of calcareous rocks (marls, sandstones and limestones.)

The whole thickness is measured from 1000 metres till 1500 m. and more. (Maximum 2000 metres.)

The series of these rocks, that has a special geological name "Flysh" in this facies is folded in some rows of parallel anticlines and synclines rather complicated with faults and overfaults.

The mass of these rocks relates to Upper Cretaceous System and occupies the flanks of anticlines and the inside parts of synclines.

The main cement plants are situated in town Noworossijsk on the north shore of Noworossijsk bay.

These plants are the oldest and largest and have quarries on the south slope of the Markoth Range. (Its average height is about 600 metr.)

In the beginning they had the annealing furnaces of an old time and therefore could only use the limestones of special chemical composition, but afterwards before the war I-st they reconstructed the plants,

supplying them with turning round (rotary) furnaces, which allowed to use all the lime and marl-rocks as rough material, except sandstones and shales.

Markotkh Range represents itself the anticline that is overturned to the Southwest and is composed by Upper Cretaceous rocks. The forests spread out on the other (North-Eastern) side of the Markotkh Range and in the valley at the foot of this Range. The South-Western slope of Markotkh Range faced to the bay, as well as the surroundings of Noworossijsk are deprived of forests.

Another cement plant is situated close to the railway station ^h ₂₀₋ Tonnelnaja (Wercne-Bakanskaya) approximately in 25 kilometres to the N - West from Noworossijsk.

The plant was built in the year 1912.

The geological structure represents an anticlinale composed by the Upper Cretaceous rocks: limestones and marls interbedded with sandstones and shales.

The reserves of these rocks are enormous.

The plant is situated on the high point of the mountain, that allows to exploit the layers with open quarries.

There are no forests around and the rocks are covered only with thin stratum of soil.

The third plant is situated close to the town-port Tuapse about 10 Kilometers to the East in the valley of Tuapsinka river and the raw materials for it are the same Upper Cretaceous rocks, which are rumpled into vertical isoclinal folds.

The reserves of these cement stones are enormous and the -----
exploitation by means of open quarries (Carriers) does not represent difficulties.

The product is of an excellent quality.

The plant is situated close to the railway that connects Port Tuapse with town Armawir, which stands on the magistral railroad N-Caucasus.

Around port Tuapse and along the railway over Caucasian Mountains till Khadyjinskaya in the North direction there are spread out great forests, which are objects of exploitation as construction materials (timber).

Among the trees on the North slope of Caucasus prevail oaks, then in less quantities pines, beeches and other trees

On the South slope of Caucasus besides these above mentioned kinds of trees grow walnut trees, chestnut trees and very precious kinds of yew-trees.

The High-way along the Black Sea shore connects Trans-Caucasus (Batum, Poty, Sukhum) with Tuapse and Noworossiysk.

Aside from the sea-shore and high-way toward the mountains already in 2-3 Kilometres you fell into jungle overgrown by subtropical weeds.

These places are comparatively very poor populated and transected with few rough roads and sometimes only with pathways for riding on horseback.

The railroad from Transcaucasian line (station Nowosenaki) that was begun in 1916-17 years is finished (till Tuapse) only after the II war with Germany and is mono-rail.

It is not steadfast enough and often breaks owing to permanent down fall of rocks, especially during the rainperiod.

The masses of light limestones and marls of Upper Cretaceous System extend on the North and South slopes of Caucasus-Range, but nowhere they are exploited as on the Black sea shore, although among them are rocks good and suitable for cement - industry.

----- . -----

In Daghestan province and in the mountains, which are situated not very far from Caspian Sea shore are developed likewise the cement limestones and marls in the deposits of upper Cretaceous system.

The MAP of BLACK-SEA COAST

On the added map in scale 1:1.000.000 or 10 klm. In 1 centimetre is shown the distribution of "flysh" series along the Black-Sea coast, that belongs to Upper Chalk deposits in the lower part of which is lying a complex of cement silicious limestones and marls.

All the south mountainous area from Gelendzhik towards the south is covered with forest, as well as the sea coast itself, but the northern parts so as of Gelendzhik vicinities, or Novorossiysk and Anapa represent themselves woodless spaces.

The coast highway joins the populated points of the sea-coast, beginning from Anapa and Novorossiysk in the direction to the south via Tuapse, Sochi, Gagra, Suchum-Kale, Poty, Batum.

The double track railway connects naval port Novorossiysk with Krasnodar, the main town of Kuban district.

Along the railway line from Novorossiysk to Krasnodar stretches out the highway road.

The main part of town Novorossiysk is situated by the Zemess bay, on the south side of it.

The cement plants and suburban of the town on the north part.

The Zemess bay is the only one haven (harbour) on the north-east part of Black-Sea coast, that is closed from the open sea and is

deep and wide enough for the big trade and navy ships and fleet
(navy ships)

From port Tuapse the one line railway is going in the direction to town Armavir and highway to town Maikop, which is a center of oil industry

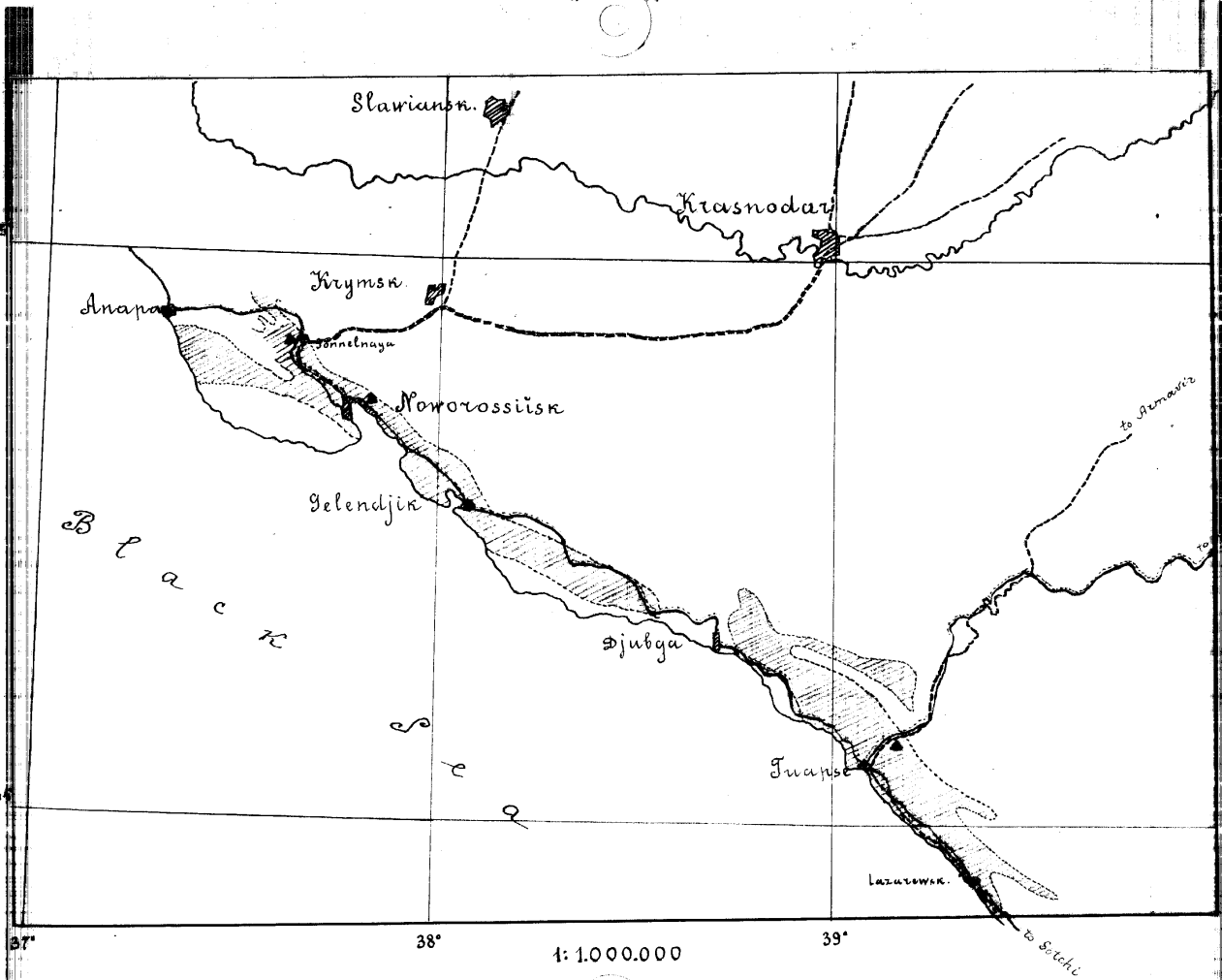
Port Tuapse in southwards is connected by one line railway with st. Nowo-Senaki (on the main railway line which connects Bacu-Tiflis-Batum and belongs to Transcaucasian railroad.)

The railways are shown with black interrupted line and highways with lilac one.

The position of cement plants is shown with index ▲

They are situated by st. Tonnelnaya, by Novorossiysk, by Tuapse and suppositionally by Gelendzhik.

The Map of Development of "Flysh" Series w. Cement Complex.



The situation of town Noworossijsk and Cement Plants.

On this sketch is shown the Range M a r k o t k h (the summit is 694 metr.), at the foot of which are situated the C e m e n t p l a n t s and q u a r r i e s for exploitation of cement marls (the average thickness of the whole cement complex equals 200-250 metres).

The Tcemess (or Zemess) bay separates the cement plants from town Noworossijsk.

As it is shown on the sketch No I the beds of cement marls outcrop on the surface in the low part of slope immediate by the Cement plants.

The situation of town Noworossiisk & Cement Plants.

NW

SE

Markotkh Range

694 metr.

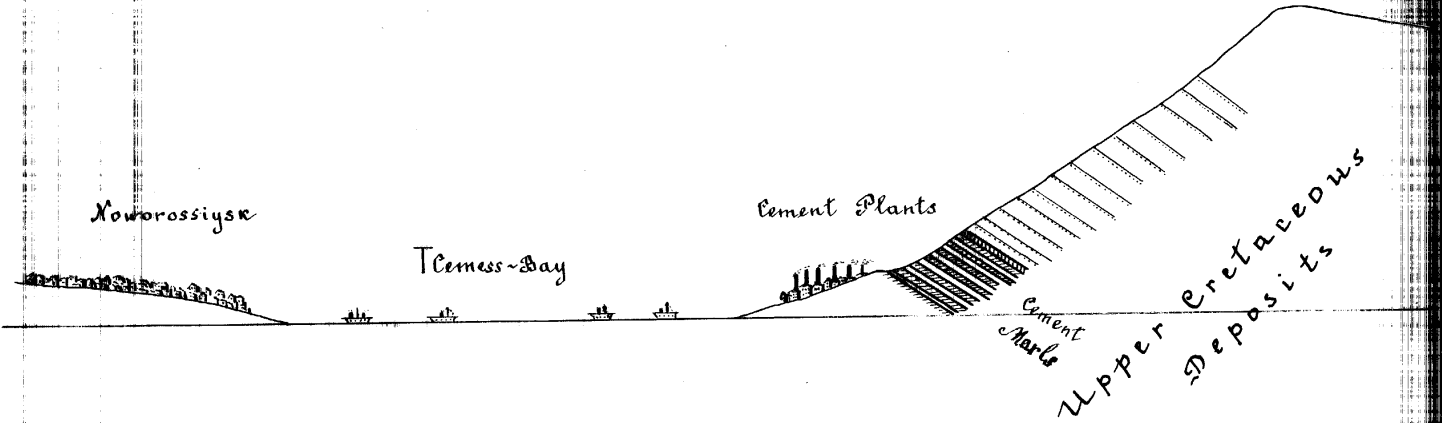
Noworossiisk

Cement Plants

Tcemess-Bay

Cement
Marls

Upper Cretaceous
Deposits



THE GEOLOGICAL STRUCTURE OF CEMENT LAYERS BY NOWOROSIJSK.

The geological structure of Markotch Range represents a rather complicated picture and on the free hand sketch No I it is depicted in a simplified view.

But in reality the Markotch Range presents an inverted syncline composed by Upper Cretaceous "flysh" and besides, this syncline is complicated by a new folding.

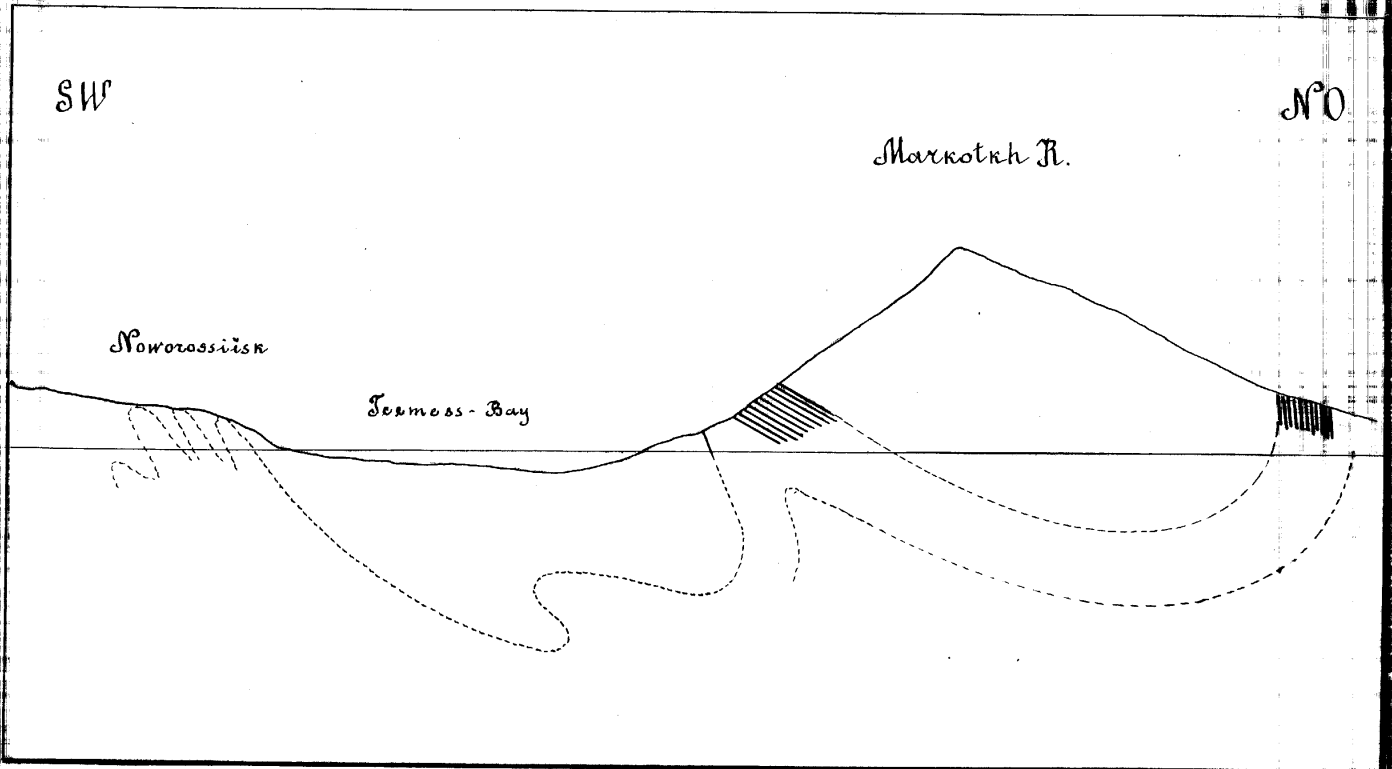
On the south-west slope at the foot of the mountain ridge is developing a new overfold anticlinale in the core of which is coming out the cement formation spread lengthwise over the whole southwestern slope.

Further, towards the south-west in the place of Zemess bay is developing a syncline ^{that} so on that spot extends a depression of which the sea takes possession.

On the opposite shore, where is situated town Noworossijsk again takes place an anticline elevation.

The free hand sketch No 2 (Cross-section) shows in the main features the character of its geological structure, though in reality it is much more complicated.

Nº 2.
Geological Structure of the Cement Layers of Noworossiisk.



Geological structure of station TONNELNAYA (Werchne-Bakanskaya)

/ Kuban district, North-West Caucasus).

Complex of cement beds takes part in the complicated folding, that is demonstrated partly on the annexed drawing.

The Anticline of Main Caucasian Range is situated towards northeast from st. Tonnelnaya.

The outcropping beds of anticline core represent dark argillaceous shales and sandstones of Lower Cretaceous.

This anticline is overturned to the south as it is shown on the picture.

The light marls, sandstones and limestones of Upper Cretaceous compose the syncline between the Anticline of Main Range and the next Anticline to the south of st. Tonnelnaya, that has a name of the "Anticline of Great Tunnel".

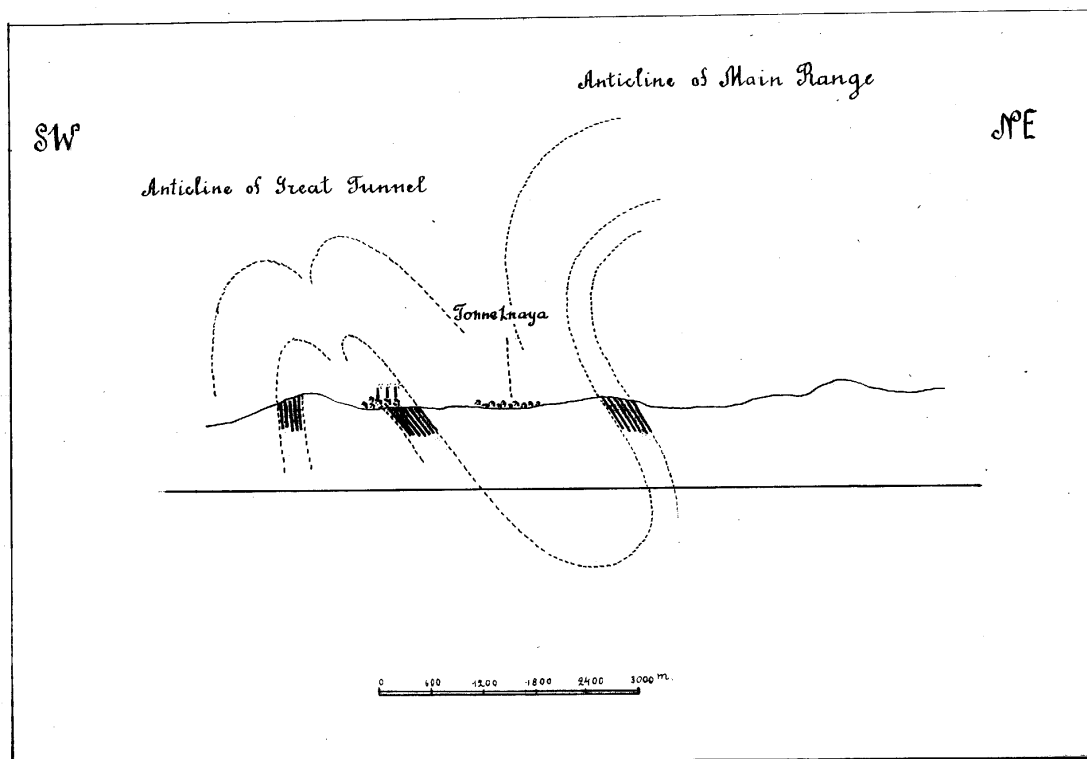
The cement plant of Tonnelnaya stands on a hill above the railway tunnel and is situated on the anticline "Great Tunnel".

The layers of cement marls and limestones outcrop in these both anticlines, but are exploited only in the anticline of Great Tunnel, where its complex is repeated several times, owing to the folding.





The thickness of beds of the cement silicious marls equals in average 10-20 centimeters and thickness of the whole cement complex equals 250-300 Meters, and the thickness of deposits of Upper chalk stretches to 1000-2000 meters.

The scale of this sketch is I: 60.000, or 6000 metr. in 1 centimeter.

Geological Structure of Tonnelnaya.



The Block-diagram of Caucasus Range between
Batalpashinsk and Teberda.

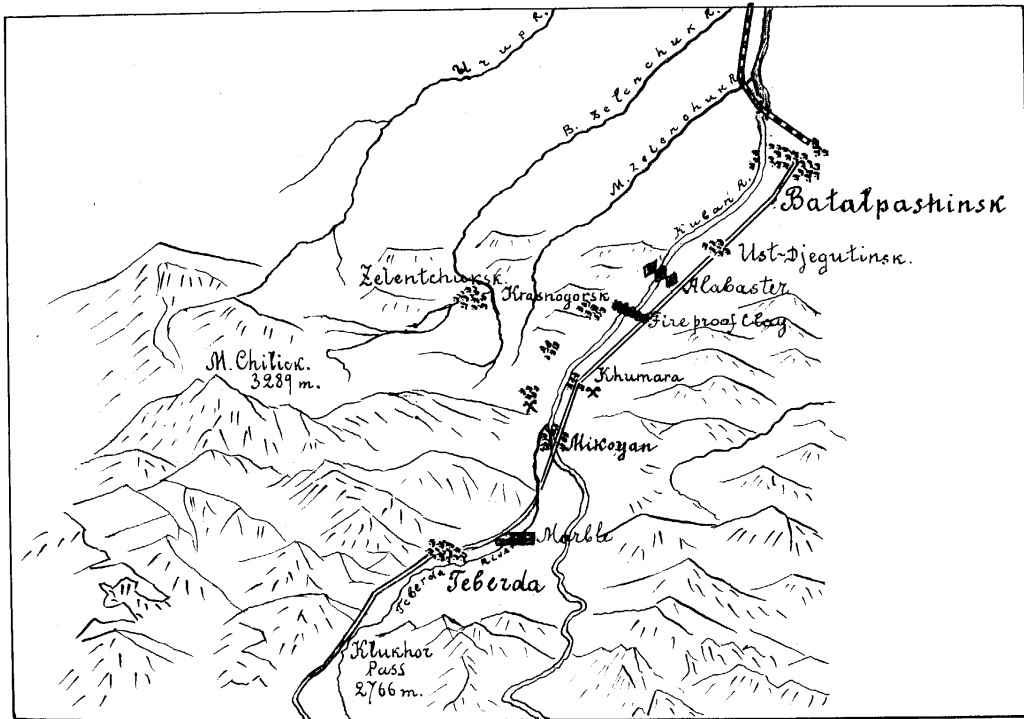
.....
On this diagram are shown the places of Marble situation, that are seen in natural exposures to the north of Teberda and are designated with sign , the fire-proof clay close to Krasnogorsk are marked with , the layers of alabaster are shown with , and the places of coexploitation are designated with a sign .

The highway over Klukhor pass (2766 metres) going along Teberda and Kuban Rivers, connects Sukchum-port with town Batalpashinsk, from which the railway goes to the station Newinomyk, that is situated on the main Caucasian Railway Magistral, which joins Rostow with Wladicaucas town.

The region of Teberda is very rich in fine construction forests, particularly with beech and pines. (Timber forest)

The map of forest may be presented if it would be needed.

The Kuban River between Teberda & Batalpashinsk.



Marble on the Teberda River

The layers of marble are situated on the right side of the valley of Teberda river, in several kilometers toward north from the cure place (kurort) Teberda.

The layers are exploited by means of open quarries. Marble is of light-yellow colour and transected with veins of calcite. The heads of layers are more denudated and marble is more fragile than in depth, where the quality of product augments with deepening. The thickness of layers is measured by 10-20 and more meters.

The geological structure of that place is very complicated and it is impossible to expound it in short words. Marbles are lying among the crystalline shists and mica gneiss whose age is not determined and they are suppositionally refered to Algonkian (Proterozoic).

Complex of these rocks stretches out farther toward southeast and northeast following the strike ^{of beds} along the northern slope of Caucasian Range and outcropping marbles ^{are seen} in the vallies of all big rivers, that intersect this slope (Kuban, Zelentchuk, Urup, Laba rivers and oth.) in transversal direction.

But owing to the bad state of roads the beds of marble are not everywhere accessible for working as on the River Teberda.

The fire proof clay.

The fire proof clay was found in the valley of Kuban river close to the stanitza (settlement)Krasnogorsk (to the South of Batal pashinsk region).

The fire proof clay forms layers among the grey sands with coal remains and plants and represents grey plastic clay without calcium (not calcareous).

The thickness of layers is measured by some metres and varies on the strike.

On the added sketch is illustrated the geological structure and situation of these clays.

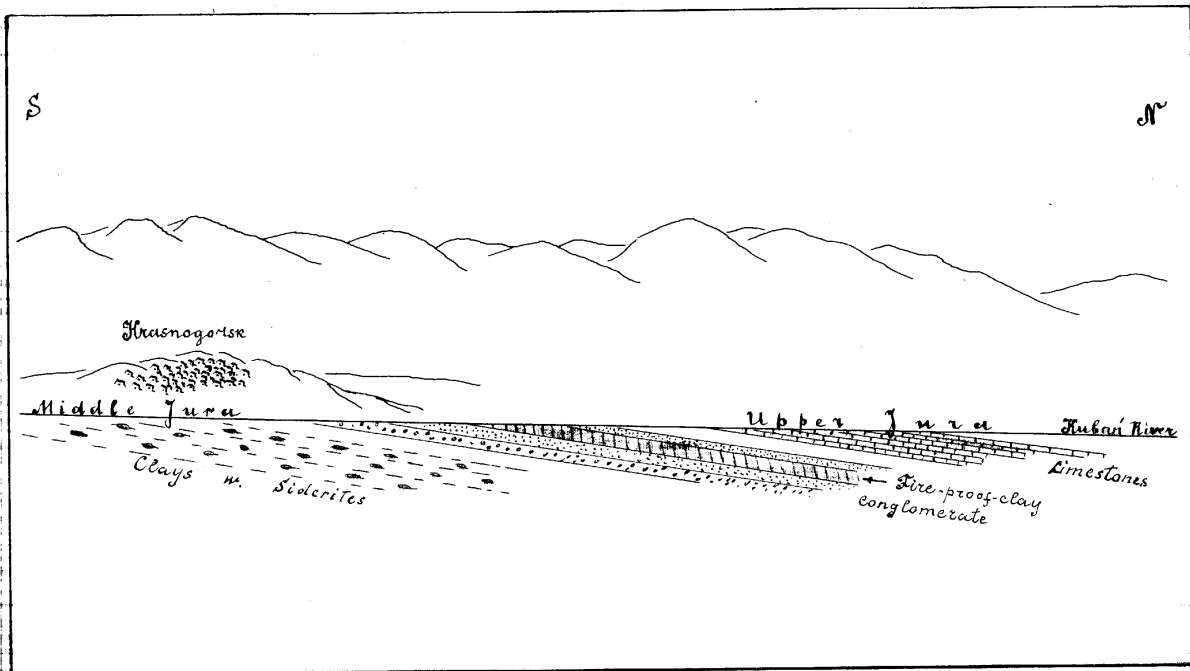
The geological age of the whole complex refers to Kelloway-stage. In the ground is lying basal conglomerate, which is resting on the grey plastic clays with siderites, that belong to Middle Jura system. Higher in the section, above the basal conglomerate follow grey sands with remnants of plants and layers of fireproof clay.

The more considerable layer of the same clays lies among the sands and is covered by the similar sands as below.

Higher in the section overlaying them are beds of light grey limestones, which form a constant complex on the north slope of Caucasus that refers already to the Upper Jura (Oxford-kimmeridge)

All the beds dip to the north under an angle in average about 4°

Geological Structure of Krasnogorsk ~ ~ fire-proof-clays.



12

The Layers Of Alabaster in North Caucasus.

The famous layers of Alabaster in North Caucasus are situated in the basin of rivers Kuban, Zelenchuk, Urup, Laba that belong to Kuban district and in the rivers Malka, Baxan and others of Terek district.

The layers of alabaster are deposited among the many coloured clays (green, grey, red, violet) in form of great lenses and "stock's" of several tenth metres thickness or in form of beds interbedded with white and grey dolomites containing gypsum and sulphur.

The geological structure is monoclinale and the angle of inclination of beds is very small -4° in the direction to north-east. The reserves of alabaster are immense and spread out on a great distance.

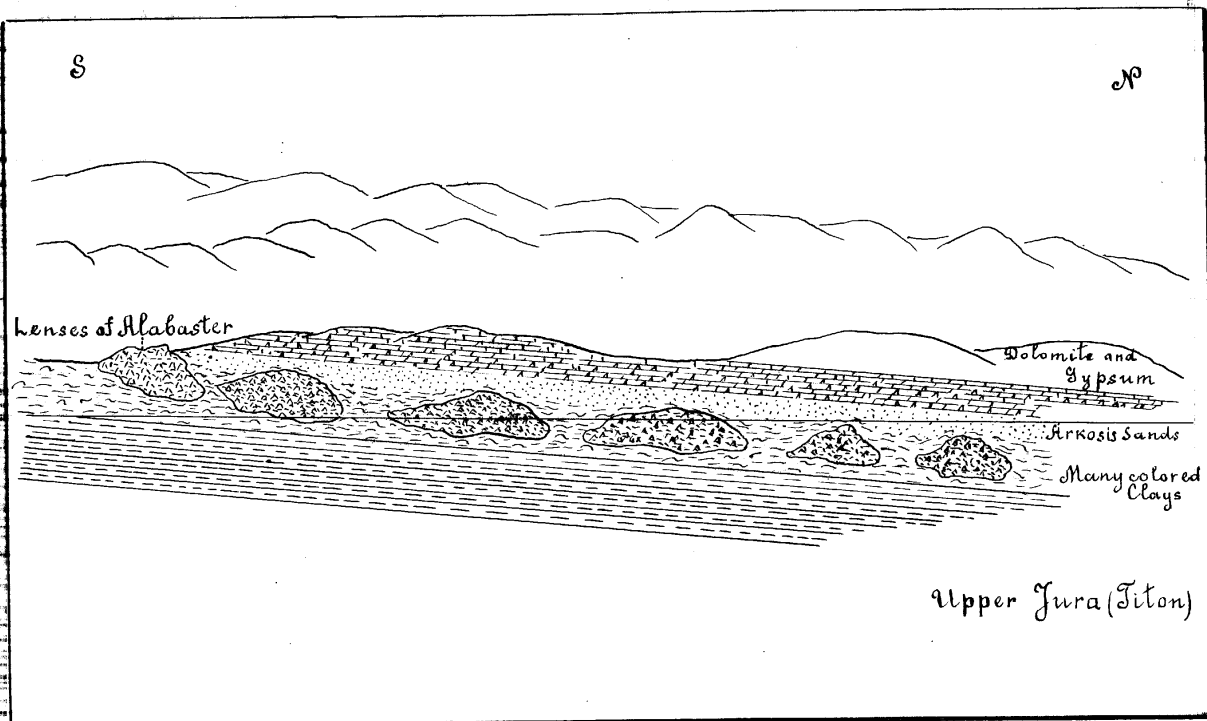
Alabaster represents a compact crystalline rock of white colour, rather hard and completely clean. The dimension and thickness of alabaster layers is different and varies from several metres up to 25-50 metres.

The series of this rock refer to the upper part of Jurassic system (Turon) and has a great development on the North-Caucasus. The western points and places of alabaster layers are situated in valleys of the north ranges of Caucasian Mountains towards the south of Labinsk region (Laba, Urup rivers), Batalpashinsk region (Zelentchuk river, Kuban river), Kislovodsk region (Bermamyt Plato, Kitch-Malka Riv.), Naltchik region (Baxan river and others.)

The eastern points and places of the development of Turon series in the same kind of facies are situated in Daghestan in the basin of Sulak river, where there are present layers of alabaster among the red and green clays and dolomites with gypsum and sulphur.

The working of alabaster is produced through the open quarries. There are no difficulties in exploitation or in transportation.

Geological structure of the layers of Alabaster along Kuban-river.



The Jurassic limestones of Crimea.

The Ridge of Crimea mountains faced to the Black-Sea is composed by Upper Jurassic dolomitic limestones sometimes porous, some times massive among which there are many layers of stratified limestones, good as construction materials that are utilized for building on the Crimea coast.

These limestones spread out on the Crimea coast from Balaklava, where they compose the coastal cliffs up to Alupka and Jalta, where they form the upper part of Crimea Ridge with vertical escarp (precipice) faced toward the sea.

This mass of limestones gives mighty downfalls, especially owing to earthquakes.

For instance in the vicinity of Alupka they form chaotic piles of immense pieces of limestones ("Stone Sea").

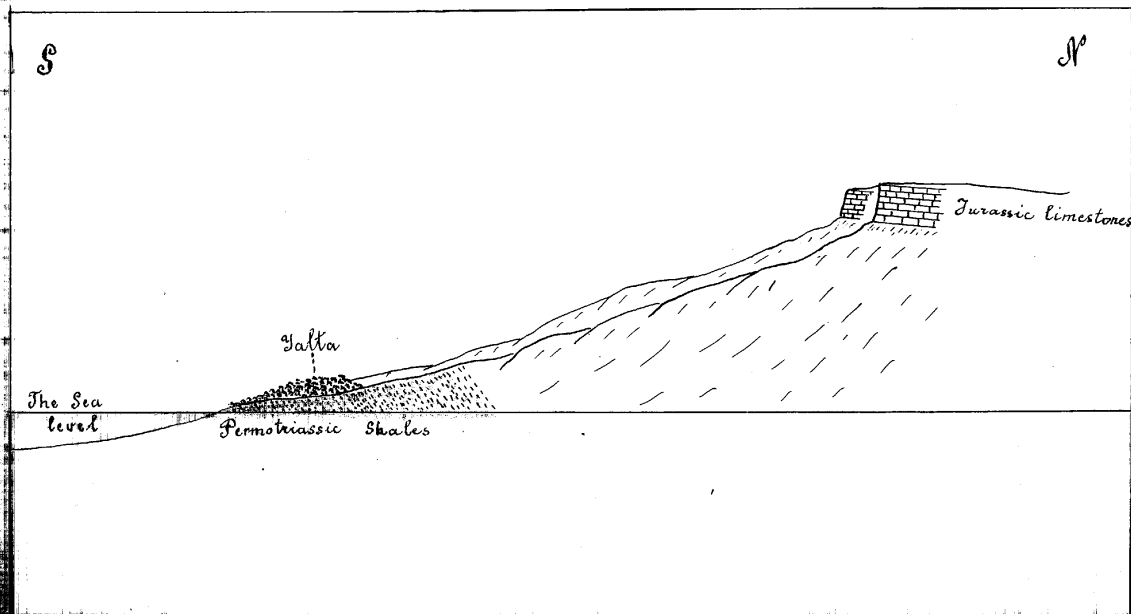
From Jalta they descend from the ridge to Theodosia sea-shore and go down into the depth.

This mass of limestones the thickness of which is measured by hundreds of meters and that refers to Upper Jura is lying with inclination towards north.

The Jurassic clay-shales and clays lay under it and along the sea-coast are outcropping the dark schistous clays forming folds, that are referred to Permotriassic.

The outcrops of Jurassic limestones extend along the south coast of Crimea within 150 kilometres.

The schematical sketch of geological Structure
of Black Sea shore and Mountains of Crimea.



6

CONSTRUCTION SHELL-LIMESTONES
.....

The Odessa shell limestone

The town Odessa, port on the Black Sea shore, is built from the white shell-limestones that are composed by the small sea shells of Pelecypoda of lower Pliocene (Pontian stage)

The limestones are porous, but rather hard and form layers. The content of quartz is very small, or limestones are nearly without it.

The quarries are situated around the Odessa town and along the sea coast.

The beds lie almost horizontally.

The environs of town Odessa are deprived of any forest.

7

The Sebastopol- limestones (CRIMEA)

In the direction to the North and North-West from town and port Sebastopol are situated the INKERMAN HEIGHTS, composed of Eocene nummulitique compact limestones, that are exploited with the open quarries. The buildings of Sebastopol are constructed of this material, that is so easy got and transported by the water.

KERTCH SHELL - LIMESTONE

The yellowish limestones composed by small shells and their debris are developed particularly in the middle part of Kertch peninsula in Crimea, where they form several ranges of latitudinal extension (stretch).

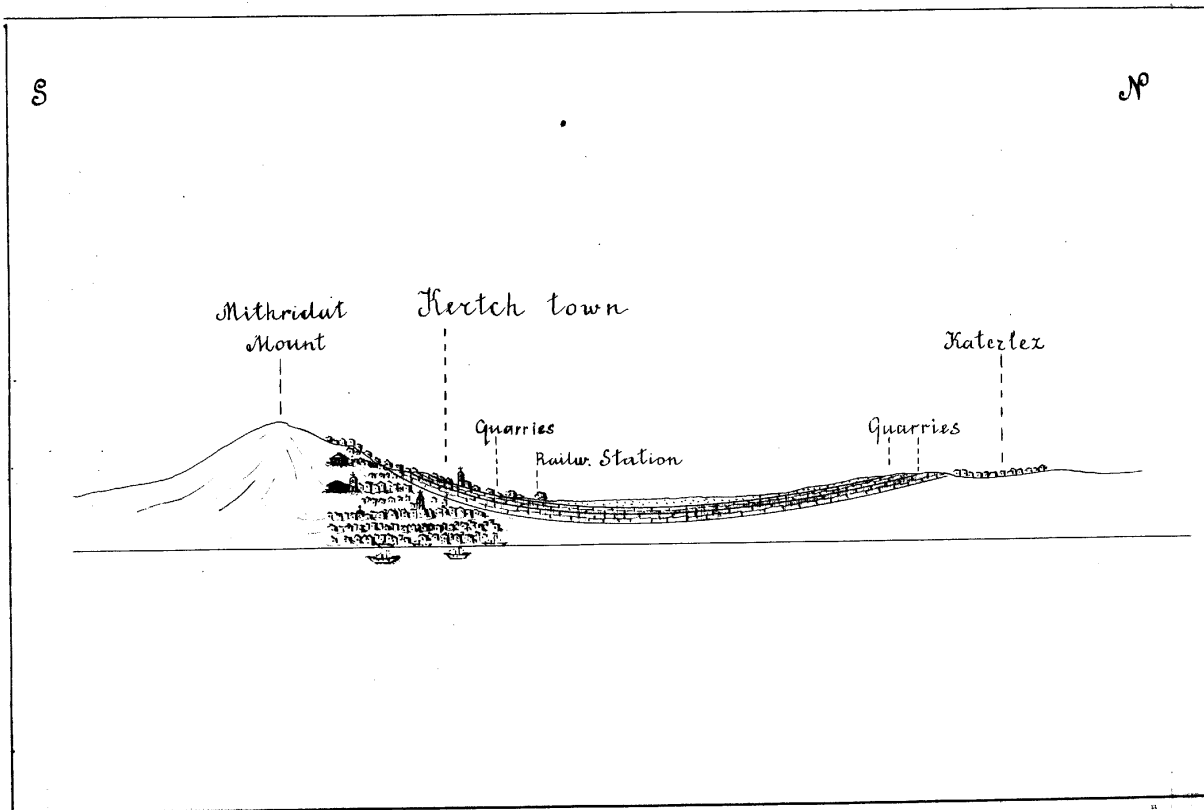
On the side of one of these ranges, that is directed toward the Sea is situated town Kertch, the buildings of which are constructed from these limestones. They are suitable for fashioning and are in so much soft that can be very easily sawed when in humid state.

Besides the limestones are to be found in plains and vallies, where they are spread out and exploited through the open quarries and underground pits.

Great quantity of these pits is disposed to the North-West from town Kertch (about 12 kilometres)

The beds of constructive limestone have a thickness from 0,5 up to 2 Metres and are interbedded with sands, clays and marls. The geological age of this Kertch limestone is Upper Miocene of Tertiary System. Series of beds to which it belongs refer to Maeotian stage, that lies between Sarmatian (below) and Pontian (above) stages. All the middle part of North-East and South-East spaces of Kertch Peninsula are occupied with these rocks.

The Geological Structure of Kertch ~ Syncline (Mulde), composed with construction shell-limestones of Maecotian Stage.



The whole thickness of Maeotian Stage may be counted of 60 to 80 metr.

The geological structure has a form of large and wide synclines, which are filled with these sediments, between great anticlines.

The pontian and maeotian shell-limestones are developed in the north-west part of Caucasus :On the Taman peninsula and on the end of the Main Caucasus Range, especially to the south of Kuban river on the northern slopes and branches of the mountains.

Many villages are constructed from these materials and many quarries are there for the exploitation of these rocks, but the quality of them is not so good, as in Odessa and Kertch.

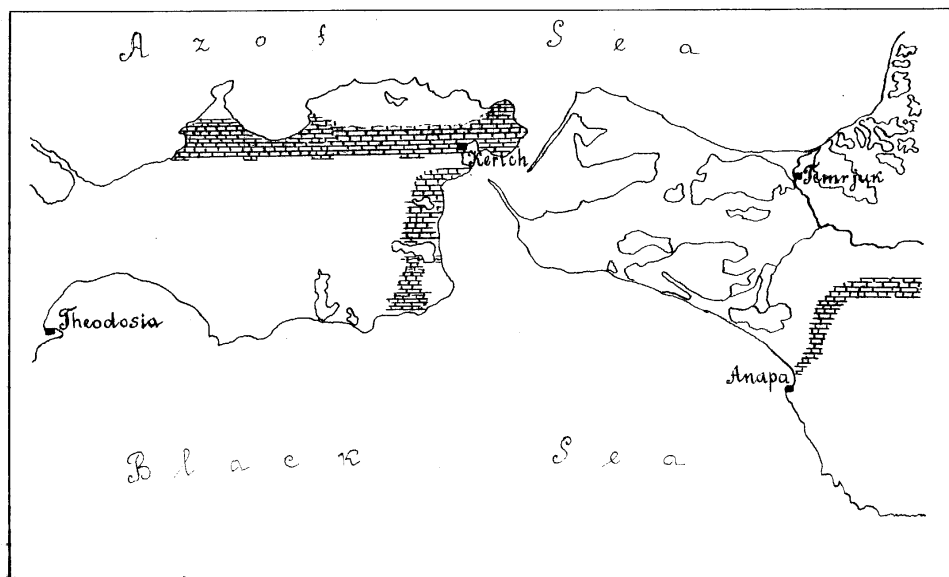
These limestones have a wide development, particularly in the vicinities of Anapa, Krymskaya, Abinskaya, Kalushskaya.

----- . -----
The first sketch represents a cross-section through the Kertch Mulde (syncline) between the town Kertch and village Katerlez, where especially is developed the exploitation of these limestones and are situated numerous quarries.

This sketch shows the geological structure and position of Kertch limestones.

----- . -----
The another drawing-little map of scale 10 klm in 1 centim. or 1:1.000.000 illustrates a development of Kertch construction limestones on the Peninsula Kertch and in the West part of Kuban district.

The Map of Kertch Peninsula (Crimea) & Taman'.
The Development of Kertch Construction Shell limestones.



10

The construction shell- limestones
of STAWROPOL HEIGHTS.

The Mountains of Stawropol (Stawropol Heights) represent a
Highland (Plato) that is covered by the shell-limestones, which pre-
serve it from erosion.

Owing to these hard shell-limestone rocks the erosion, which took here
place could not level these mountains to hills, but divided them only
in separated table-formed heights

On one of these Heights is situated town Stawropol, all the houses of
which are made from this porous yellowish limestone-very suitable
building material.

The beds of limestone have an average thickness from 1 up to 2 meters
and can be very easily exploited through the open quarries.

The beds of limestones are interbedded with shell-sands, quartz sands
and light clays.

Underlying the limestone complex are sands with layers of clay and
below them mighty series of clays interbedded with marls.

All these rocks belong to the Sarmatian stage (Upper Miocene)
and are lying almost horizontally with a very small angle of inclina-
tion to the North, from the Stawropol Height.

Gradually the beds of shell-limestone descend from the mountain toward
the plain.

II

The villages situated to the North from Stavropol have like the town buildings of the same material, or from the stratified marls that interbed the clays under the sands.

The territory occupied with these Sarmatian limestones has great dimensions of the tenths of kilometers and on these spaces the quality and thickness of limestones changes several times.

C o n s t r u c t i o n s a n d s

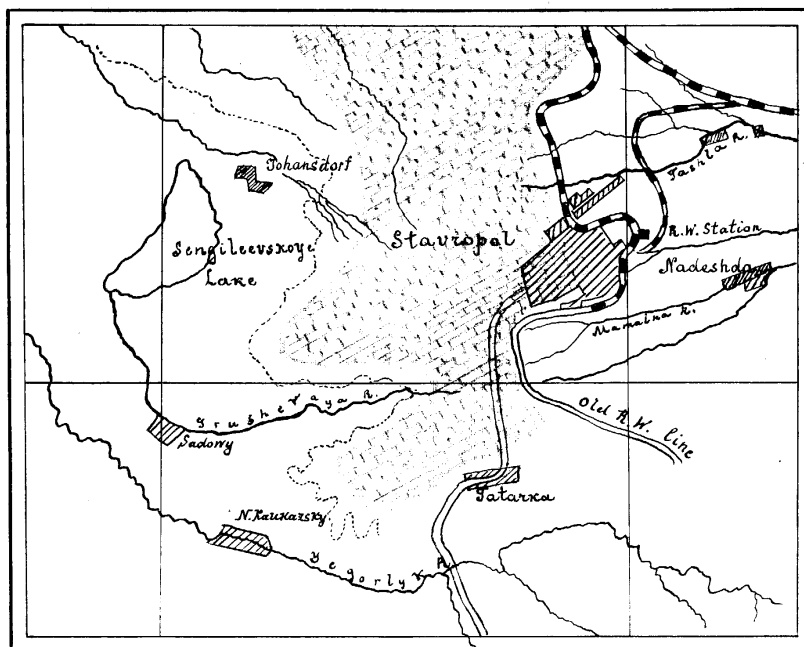
The sands interbedding the shell-limestones can not be utilized, owing to their fine-grainity as an add-material by producing a construction calcareous cement.

The building coarse-grained sands overlie the I upper limestone and are seen in some places of Stavropol plateau near the surface. They contain the bones of Mammals of the Maecotic stage (Upper Miocen).

The deposition of these sands is quite horizontal and the visible thickness is measured from 2 to 4 metres.

The Development of Shell-limestones in Stavropol Plateau.

1:210,000.



The illustration of geological structure of STAWROPOL

On the applied drawing is demonstrated in a perspective geological section one of the most northern plateau on the northeast slope, on which is situated town Stawropol.

There is very distinctly denoted the situation of 2 horizons of constructing shell limestones- I st the upper one and II -nd the lower divided by a horizon of fine-grained quartz-sands. The stratified limestones are of yellow colour and partly crystallized. They are disposed near to the surface and worked up by open quarries without explosive applications.

The thickness of separate strata is equally from 0,5 to 2 metr. Very often the hard limestones are interbedded with more friable limestones and even shell-sand, which is composed of the shell-fragments of sea mollusca of the upper Miocene age (Sarmatian stage).

Under the stratum II are lying arenaceous clays and argillaceous sands and sandy clays with gypsum. Under these series lie the clays intercalated with beds of marls.

Town Stawropol is situated, as it can be seen on the drawing on the above mentioned rocks and the II limestone forms a plain terrace on the surface of which are distributed the main public places and squares. The upper part of Stawropol Plateau is covered by forest and represents

a water gathering area, but the slopes are woodless and the earth-slides have a great development.

The Illustration of Geological Structure of Stawropol-Heights
α. Demonstration of geological position of construction shell-limestone.

NW

SE

Stawropol ~ Heights

Stawropol town

Railw. St.



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