FELDSPAR

IN THE POTTERS' FIELD

PUBLISHED IN THE INTEREST OF

THE CERAMIC INDUSTRIES

VOLUME THREE

BY

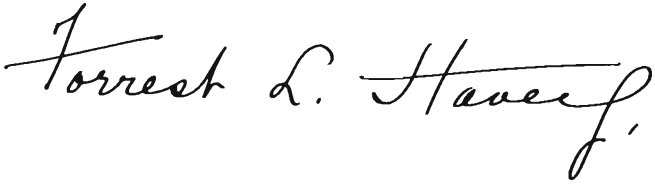
THE CHAS. M. FRANZHEIM CO.

WHEELING, W. VA.

SUMMER, 1921

Lepidolite
Geode

The cuts shown in this pamphlet are views of some of the quarries and ledges of the Maine Feldspar Company.



THE CHAS. M. FRANZHEIM CO.

WHEELING, WEST VIRGINIA

SALES OFFICE

OF

The Maine Feldspar Company

BRUNSWICK, ME.

QUARRIES AND WORKS:

Plant No. 1 - - - - - - - - - - Auburn, Maine

Plant No. 2 - - - - - - - - - - Topsham, Maine

Grand Trunk, and Maine Central Railways

FELDSPAR is a compound of silica and one or more of the bases—potash, soda, and lime. There are two principal commercial varieties—the potash spar and the soda spar. Both of these may be present in the same deposit or in the same crystal. The principal members of the potash group are orthoclase and microcline. These varieties are so nearly alike in chemical composition and physical properties as to be considered commercially identical. The theoretical composition of pure orthoclase or microline is silica 64.7 per cent, alumina 18.4 per cent, and the potash 16.9 per cent. The potash may be partly or completely replaced by soda. When the soda content is greater than the potash content the feldspar is called anorthoclase.

Potash feldspars range in color from white to reddish and some are gray. The soda feldspars vary from white to pale green in color. When first taken from the quarry feldspar is so hard that it is with difficulty scratched by a knife.

The most of the feldspar mined in the eastern part of the United States is of the potash or soda variety or a mixture of the two. These varieties are used in the pottery industry because after being melted and cooled they form a glass, whereas lime-soda feldspar under these conditions becomes crystalline.

—From Bulletin Department of the Interior—United States Geological Survey.

AN INTRODUCTION TO THE FELDSPAR FAMILY

WE ALL KNOW FELDSPAR, or at least we have heard of the word, or perhaps we may have actually used this mineral. But we are quite certain that all of us do not know that the word "Feldspar" is a family name;—just like Smith or Jones, and that there are as many members of the Feldspar Family spread around over the globe as there are Smith and Joneses.

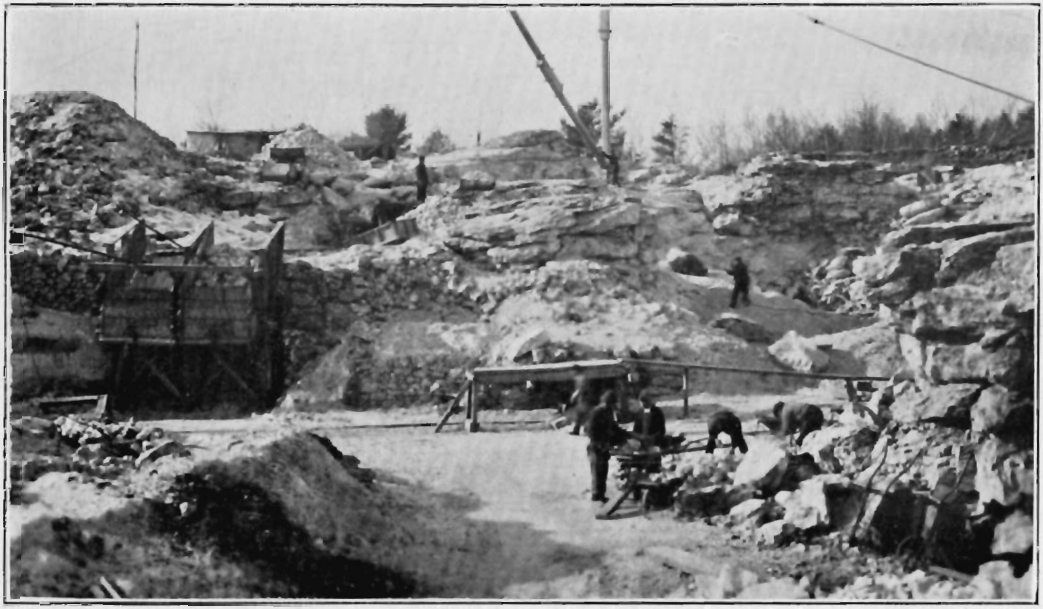
We have John Smith and William Jones, and a million others;—some are ministers and some are thugs;—some fit and some unfit;—some good and some bad;—all different kinds.

Just so with the Feldspar Family,—all varieties and kinds,—good, bad and indifferent.

The word "Clothing" is a general term covering all forms of raiment, from the haughty dress suit to the humble overalls, and includes shirts, socks, B. V. D.'s and all varieties of raiment, regardless of station or specific use, but just the same, all "Clothing,"—and all entitled to the same name.

The word "Feldspar" is a general term, a family name, in mineralogy covering the most important rock forming group of minerals, and covering ALL forms of Feldspar. The family is large and varied.

The extent of the size can be observed when it is noted that nearly three-fourths of the known surface of the earth is formed of gneiss and granite, containing from sixty to ninety per cent of Feldspar. The vast bulk of which is useless for Ceramics.



May we take the liberty of presenting to you:

THE FELDSPAR FAMILY

The most important members of this large family are:

Monoclinic.....	Orthoclase		potash-felspar
Triclinic.	Microcline		potash-felspar
	Albite	Plagioclase	soda-felspar
	Oligoclase		soda-lime-felspar
	Andesine		soda-lime-felspar
	Labradorite		lime-soda-felspar
	Anorthite		lime-felspar
	And others		

Anorthoclase Feldspars are the soda Feldspars. Members of this family not mentioned in this classification are of minor importance.

In explanation of the classification:

Monoclinic refers to the crystalline nature, and means "having one oblique intersection of the axes." This group is the common side of the Feldspar Family.

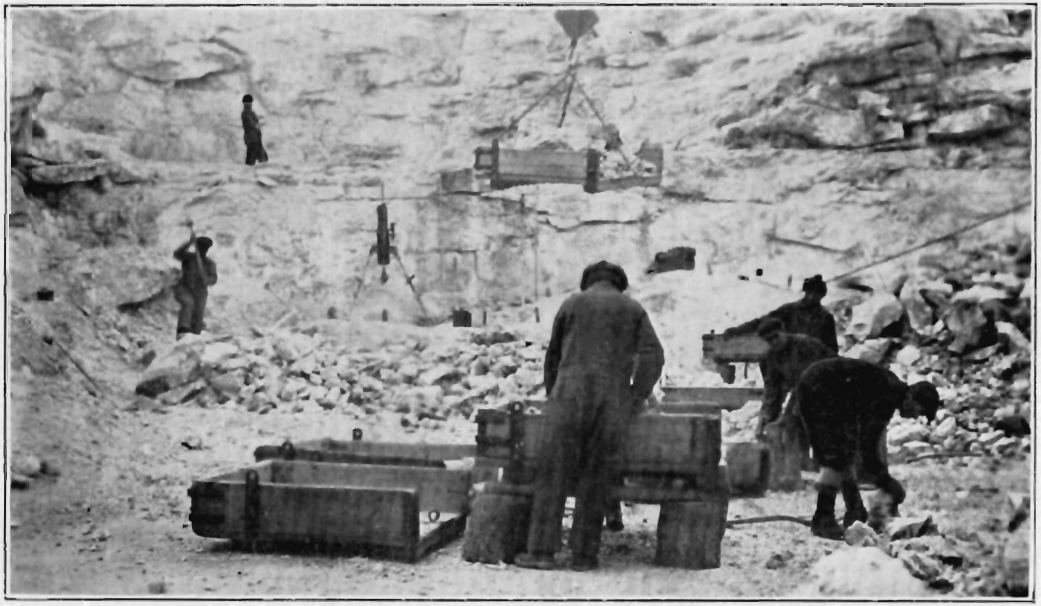
Triclinic also refers to the crystalline nature and in this case, its explanation is rather complicated and confusing. This group are the aristocrats of the Feldspar Family.

The other subdivisions refer to the chemical nature.

It is to be noted here, that the monoclinic class has but one member to its family, namely, Orthoclase Feldspar.

The Triclinic group claims practically all remaining members of the family as noted.

The Ceramic Trades use the word "Feldspar" in a specific sense, meaning the Monoclinic Orthoclase Feldspar. At least, the Orthoclase is usually inferred and implied when speaking of Feldspar, though very seldom specified.



Orthoclase Feldspar should be the standard pottery mineral, and is.

Really, the Clay Trade should abandon the word "Feldspar" altogether, and adopt the more specific term "Orthoclase." When we want a pair of socks, we ask for socks, not "clothing." When we ask for "Feldspar," we want Orthoclase. It is just as easy to write "please quote us on Orthoclase in carlots," then we have said just what we mean.

MONOCLINIC

ORTHOCLASE FELDSPAR

From the Greek word "Orthos," meaning straight, and "Klasis," meaning a fracture;—or a right angle fracture. It occurs most frequently in the form of imperfect crystals or irregular crystalline aggregates.

In porphyritic rocks, and especially in drusy cavities in such rocks as granite, it often appears in tolerably well-developed crystals. It is an essential constituent of granite, syenite, orthoclase-porphyry, and quartz-porphyry.

The compact ground-mass of the two last mentioned rocks is largely composed of micro-crypto-crystalline orthoclase.

Orthoclase occurs also as an accessory ingredient in most plagioclase rocks, and is present in many of the crystalline schists, especially the gneissose rocks.

A clear glassy variety of orthoclase called SANIDINE is a common constituent of many igneous rocks of Tertiary and recent date, such as liparite, phonolite, trachyte, etc.

Orthoclase, as a rule, is readily acted upon by the weather—the potash and some of the silica being removed in solution, while a fine-grained clay is left behind. Ordinary orthoclase is either gray, white, or flesh-colored, and these tints of the Felspar generally determine the color of the rock in which it occurs. Thus we have GRAY granite and RED or PINK granites.

TRICLINIC

MICROCLINE FELDSPAR

Microcline is like Orthoclase Feldspar in composition but Triclinic in form. It approaches orthoclase in crystal habit. Its cleavage angles differ so very slightly from a right angle that it might be well looked upon as simply another form of orthoclase Feldspar, but as the classification is by form, it is, therefore, put in the Triclinic group. It is frequently associated with orthclase in the plutonic and schistose rocks.

All of the remaining Triclinic Feldspars are grouped together as PLAGIOCLASE. (GR. plagios, "oblique," and klasis, "a fracture;" in reference to the cleavage-planes, which are not at right angles to each other), and are among the most important rock-formers.

The Ceramic Trade is not especially interested in Plagioclase Feldspar. But they belong to the Family, and we want you to become acquainted with them just the same.

PLAGIOCLASE

Is an essential constituent of many igneous rocks, and it is likewise met with in many crystalline schists, in which it is the product of hypogene metamorphic action.

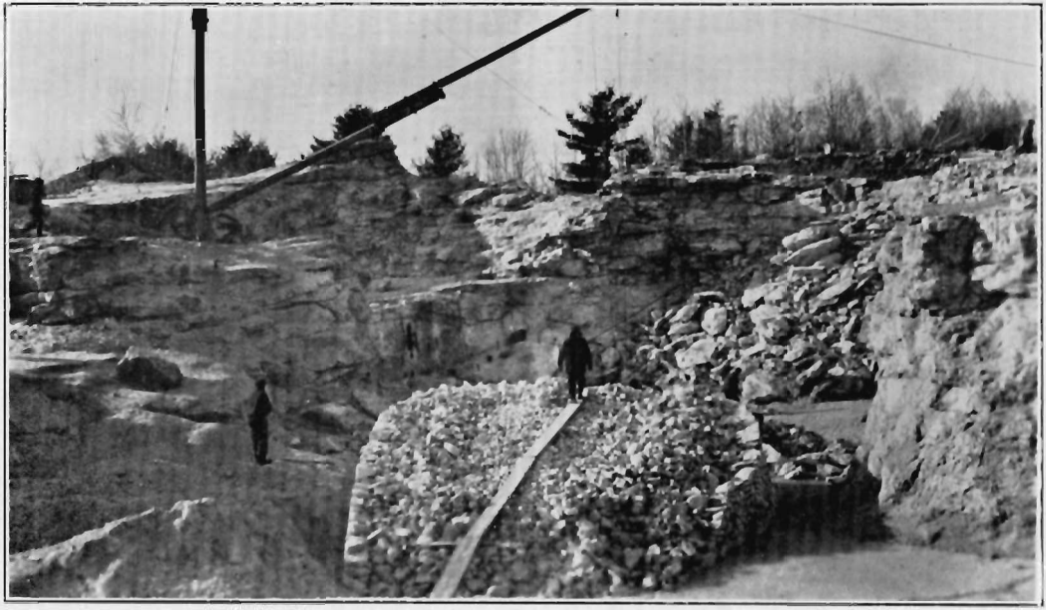
Albite is a common constituent of some crystalline schistose rocks and certain crystalline limestones. As a secondary product it is occasionally met with also in igneous rocks.

Oligoclase occurs both in the older and younger eruptive rocks, in hypogene rocks and in true volcanic rocks.

Andesine is met with rarely in crystalline schists, but it is a common constituent of some eruptive rocks, such as andesite.

Labradorite is an essential constituent of such rocks as gabbro, basalt, etc. It occurs also in metamorphic rocks, sometimes in large crystalline masses. It often shows fine chatoyant reflections, receives a fine polish and is occasionally employed in jewelry.

Anorthite is not common as a rock former. It occurs in some basalts and andesites, and sparingly in a few crystalline schistose and granitic rocks.



UNCERTAIN OR MONGREL FELDSPARS

The Felspars which occur in rocks that contain much free silica (quartz) are generally orthoclase and microcline, but with these are frequently associated the highly silicated Felspars, albite, and oligoclase. The chief habitat of the basic plagioclase Felspars are basic igneous rocks.

Adularis is a transparent variety orthoclase, often showing pearly opalescent reflection, and sometimes a play of colors. The finest specimens of this variety are cut as ornamental stones, and known as MOONSTONES (some moonstones, however, appear to belong to albite and oligoclase): another kind, found among rolled stones in Ceylon, are remarkable for the reflection of a pearly light.

Sunstone, or Aventurine Felspar, is somewhat similar to the variety of quartz called **Aventurine** in the play of light which it exhibits—a property which seems to be due to disseminated crystals or plates of hematic or gothite.

Aventurine Felspar is not always orthoclase, some of it belonging to albite and oligoclase.

Amazon-Stones is a bright verdigris-green orthoclase, fine specimens of which come from Pike's Peak, Colorado.

Peristerite is a whitish adularis-like albite.

Saccharite is a granular massive variety of andesine.

All of the foregoing gives a general idea of the extent of the family, and a general idea of its classification, based on mineralogy and crystallization.

IMPERFECTIONS

In conjunction with all or any of the foregoing, there is always found intimately associated with Feldspar many impurities, and imperfections, the bugbear of the producer and his clientele.

These imperfections are, as a rule, very difficult of separation. It is the impurities which kill most of the Feldspar deposits of the world for Ceramics. It is the impurities, seldom recorded on analysis, which hamper a greater perfection of Feldspar Products. It is the impurities which add to the cost of production, as separating them from the Feldspar is only accomplished by hand process, and by competent workmen who thoroughly understand selection and grading of Feldspar.

A bed of pure rock Spar of any size, free from impurities of some kind, is a rarity. Should a large deposit of pure Spar be found, where but little, if any, hand selection were necessary, this type of Spar could be sold very much cheaper, as naturally the costs of separation are less.

Unfortunately, most of the Feldspar deposits of the country, and of the world, always contain impurities. These impurities are likely to be any foreign mineral or substance, and usually are found;—black and white mica, garnet tourmaline, iron, mangenese, semi-precious jewels, and free quartz. Of course the black micas are usually met with and the most common, and also the most difficult of separation,—and the source of most of the black specks so noticeable in white wares.

Producers of Feldspar do not desire these impurities in their product any more than do the users, but they are required to accept the mineral as laid down by the hand of Providence.

THE PROBLEM

Every day we are confronted with a problem relating to the possibility, or possibilities, of securing cleaner, better and purer Feldspar. Our problems are just the same as other producers. Naturally, the Trade is desirous of securing the best, and of securing Spar free from imperfections, and free from impurities usually found in all Spars.

In answer to this in a general way, we should like to review for a moment the Ceramic Industry as a whole from the beginning of time down to the present day, showing the change that has taken place in the last decade.

A REVIEW

From the beginning of time, tracing down through the centuries and through the ages in the history of all countries, we read of Ceramics—all forms of vases, terra cotta, and pottery. Our ancestors of those days had no better, nor no worse, materials to work with than we have today. They were simply working with the raw materials as laid down by the hand of Providence, the same as we are doing today.

In all past records of the ancients left us, in all their Ceramic Works, we see, or read, or hear of the quality of some particular product, or of the purity of design of another, but in all of these nowhere do we see or do we hear, or do we read of any pure whites, such as we are producing today.

Their productions of art, or ware for utilitarian purposes, were highly decorated,—faience, majolicas, or terra cottas. In other words, the inferiority of the body hidden by the superiority of fine decorations or colored glaze. Wherever whites were noted they were secured, as a rule, by means of enamels, but even these were rare.

Visit any museum of Ceramics of the ancients and see how many whites can be found. Visit the Morgan collection of Chinese Porcelains, the most remarkable in the world, and practically no whites will be found. Examine the records of Ceramics in any way you may wish and you will find practically every form of Ceramics except a pure white body with a pure white spotless glaze. In other words, form or decoration in the ascendency.

The reason for this certainly must have been due to the scarcity of securing pure white materials with which to work. Certainly there would have been produced some whites in all that time had they the proper materials. There must have been no real white Clays and no real white Flints, to say nothing of pure Feldspars.

Now, we come down to a few hundred years ago when Englosh Clays were found, and some other white continental Clays, and we start producing white wares, not always so much for art purposes, as the more common utilitarian line.

We, therefore, have now grown to believe that pure, white, unsullied ware, free from blemish, for common, everyday purposes, is a necessity. It is a luxury. The buying trade today has been educated to pure white ware for the most common household use, but they can't have it purer and freer from imperfection than raw material procurable.

One concern in the East is today producing, perhaps, the finest ware and the cleanest body ever produced. In addition to this wonderful body they are adding more wonderful decoration. They are able to secure almost perfect material. A limited scale but sufficient for them. It pays twice as much for its Feldspar as anyone else, because of the extra fine grading and selection.

Suppose every Potter in the country were desirous of producing ware so pure and clean, and it would be impossible, regardless of the price they paid for the

raw material, because there wouldn't be sufficient pure, untainted raw material to supply everybody. Particularly, would this be true of Feldspar.

Unless vast quantities of pure, spotless raw Spar are found, it is not to be expected that there will be any serious improvement in the quality of the white body of the present day on a commercial scale.

There is not a Feldspar sold today on a commercial basis, which does not contain some impurities or other. These impurities are carried in the body and then magnified by the glaze, and the glaze itself may carry imperfections due to impurities in the raw materials.

The demand upon the producers of Feldspar for pure, better Spar are only natural. But no producer can give better Spar than laid down by nature. The producer can give good selection,—this is all.

There is more Feldspar being produced today than ever before, and on a general average it is much better than ever produced. The demands for Feldspar are far greater today than ever they were as new uses are continually being found for it.

But whether the demand is great, or whether the demand is small, the material itself is still unchanged. And, as, the general run of Feldspar in nature is imperfect, so likewise will the general run of the finished product be on reaching the market. It is almost impossible for human effort to remove imperfect Feldspar from the earth and sell a perfect one, so intimately are most imperfections intermingled.

FORMULA

The chemical formula of pure Orthoclase Feldspar, such as used in Ceramic Trades, is—

Silica 65.4%
Alumina 18%
Potash 16.10%

and this represented by the radical, K_2O, Al_2O_3, $6SiO_2$.

This is the theoretical composition.

Its hardness is between six and seven, that is to say they can just be scratched with a very good penknife.

Its specific gravity is 2.6.

After removing Feldspar Rock from the quarry it weathers somewhat and becomes softer. It also bleaches.

The chemical formula of Maine Feldspar will average about as follows:

SiO_2	(Silicon Oxide)	69.50
Al_2O_3	(Aluminum Oxide)	16.17
Fe_2O_3	(Iron Oxide)	.07
CaO	(Calcium Oxide)	.29
MgO	(Magnesium Oxide)	.13
K_2O	(Potassium Oxide)	9.0
Na_2O	(Sodium Oxide)	3.04
	Ignition	1.39

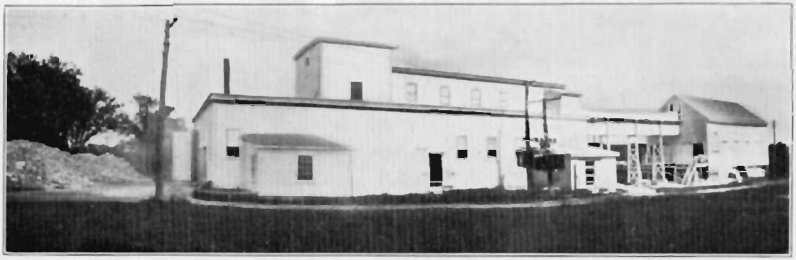
This is Orthoclase Feldspar, in the Monoclinic Class.

THE MAINE FELDSPAR CO.

The Maine Feldspar Company owns and operates two mills in the State of Maine, surrounded by many ledges and quarries of the Feidspar Rock. They mine their own rock from their own quarries to grind in their own mills. They have a monthly capacity of approximately sixty-five cars. Much pure Spar is found all through their works and workings, but if only the pure rock were used, the cost of mining would be prohibitive on the present-day commercial basis, and the production lessened an enormous per cent.

They have many ledges, veins, and quarries untouched as yet, and unopened. Much in waiting. Much hope and anticipation of pure rock in large quantity.

Commercially pure Spar is a reality, and there is sufficient for all. Chemically pure Spar on a commercial basis is an impossibility. So also, is commercially pure Spar free from imperfections.



Topsham Mill

IN CONCLUSION

No material in the Ceramic Trade has been more in the lime light in the past two years than Feldspar,—and this, for the very good reason that the demand has been greater than the supply. The demand for perfect Spar is greater than ever.

As time goes on we may hope for increased quality, a lessening of imperfections, and that some day large deposits of the pure, untainted article will be found. Although there are inestimable quantities of Feldspar in all parts of the world, commercially useable grades of the pure article, or even the nearly pure, are hard to find. Commercially useable grades of even the orthoclase are hard to find. It is, however, possible in almost any deposit to find limited quantities of pure rock in some form.

In the past few years many new Spar deposits have been found, many new veins opened up,—and much prospecting. Yet, with all of this, no one has found any better Spar than that already offered. In the majority of cases, not as good, or not sufficient quantity to place the new working on commercial basis.

Perhaps some day, after the commercial deposits of the present-day Feldspar become exhausted, which certainly will not be soon, we may all have to return again to heavy decorating in order to hide an inferior body, just the same as the ancients used to do.

THE MAINE FELDSPAR CO.

BRUNSWICK, MAINE

FELDSPAR

THE CHAS. M. FRANZHEIM CO.

WHEELING, WEST VIRGINIA