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OF

MINERALS

For Scientific and Educational Purposes.

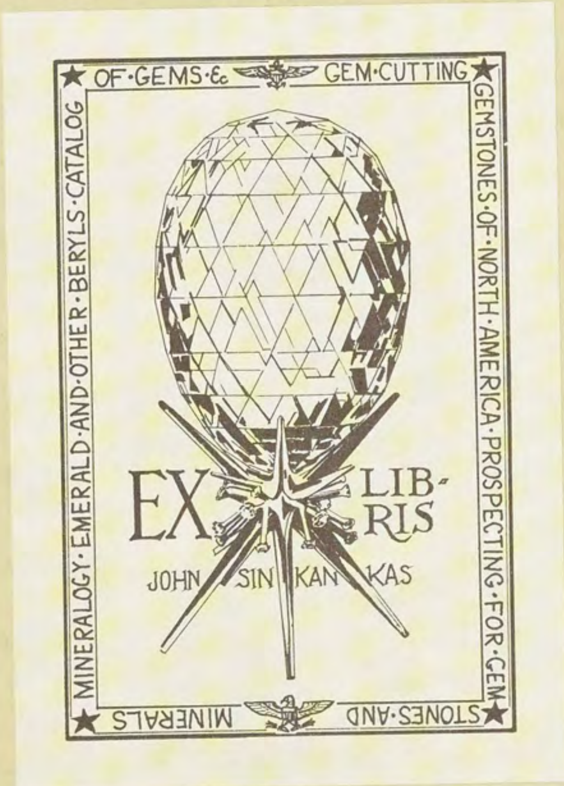
LOOSE CRYSTALS A SPECIALTY.

ROY HOPPING,

5 & 7 DEY STREET, NEAR BROADWAY,

NEW YORK CITY, U. S. A.

1899.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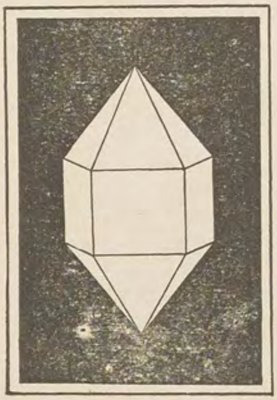

ROY HOPPING,

5 & 7 DEY STREET,

NEW YORK, U. S. A.

J. L. DOWNER,
PHOTO-ENGRAVING,
202 Broadway,
NEW YORK.

S. MORRIS HULIN,
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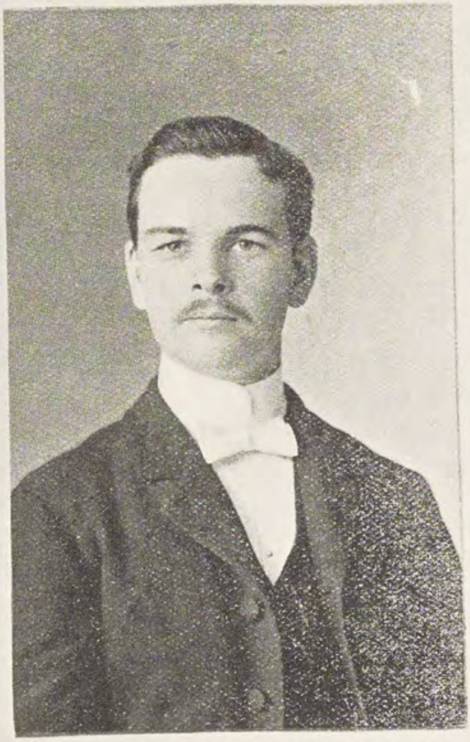


Sincerely,
Roy Hopping.

CONTENTS.

STUDENTS COLLECTIONS.

ORDER FOR SPECIMENS $1\frac{1}{2}$ x 2 INCHES IN LARGE QUANTITY.

Hall of the Board of Education, Clerk's Office.

New York, Nov. 18, 1897.

No. 10728

MR. ROY HOPPING:

Please deliver immediately with Bill and Duplicate to the Depository, the following articles, viz.,

Minerals as per list attached, $200.00.

JOHN M. MULLEN,

Clerk of the Board of Education

STUDENTS COLLECTION, 50 SPECIMENS, 2 x 3 INCHES.

East Florida Seminary,
State Military and Collegiate Institute,
Gainesville. Florida,
Edwin P. Cater, Superintendent.

May 3, 1898.

MR, ROY HOPPING,
New York.

Dear Sir :

The collection of minerals ordered of you recently has been received. Enclosed find five dollars in payment. We are very much pleased with them.

Yours truly,

(MAJ.) W. L, FLOYD,

Prof. of Natural Science.

PLATE II.

KROKOITE FROM DUNDAS, TASMANIA.

NEW ARRIVALS.

KROKOITE FROM TASMANIA.

Krokoite, Crocoite or Crocoisite is chromate of lead, $PbCrO_4$ and occurs in crimson monoclinic crystals, with prismatic developement.

"A well known beautiful mineral, generally supposed to be peculiar to the silver-lead mines in Siberia.

"Its first discovery in this island was made a few years back by Messrs. Smith and Bell at the Heazlewood Silver-Lead Mine. It there occurs of its characteristic bright, shining, hyacinth-red colour, in somewhat small, thin, aciculine bunches penetrating and often coating a soft ferruginous clay gossan, commonly with minute crystals of Cerussite and Pyromorphite. At the Whyte River Mine it was found plentifully in the country rock, a soft decomposed Diorite, abutting on to the lode, coating the faces of fractures and cleavage planes. In some instances flakes of the mineral several inches in diameter were detached. Rarely patches of small monoclinic crystals occurred, but this was exceptional.

"In vughs occurring in the capping of the lode or the adjacent country rock were often found to be thickly coated with bunches of the mineral, of bright colouration and of great beauty.

"At Dundas, this mineral is very plentiful. It commonly occurs in large, columnar prisms, often several inches in length, penetrating the vesicular ferro-manganese gossan that overcaps the lode. In the workings of this mine some extremely fine and beautiful specimens have been obtained, the mineral often coating white Dundasite, and occasionally associated with crystals and large bunches of Cerussite and more rarely Anglesite. In some samples the red prisins penetrate the gossan intermixed with botryoidal Psilomelane, and occasionally patches of Galena occur in the more solid portions; occurs on Embolite, Mount Stewart Mine, Heazlewood."—*Minerals of Tasmania*, by W. F. Petterd.

Note. - *Gossan* is an "iron cap" gangue rock and a *vugh* or *vug* is a geodic cavity. Both were originally Cornish mining terms, now used generally but not in the United States.

During the summer we received two small shipments of this exceeding rare and beautiful mineral from the Dundas locality and can offer small groups very cheap, mounted, at 50c, 75c, $1.00. A few large groups, fine crystals, $2.00 to $500.

ENDLICHITE FROM NEW MEXICO.

A very nice lot of brilliant crystallized specimens of this rare arsenate, vanadate and chloride of lead have just been received. The sharp little hexagonal prisms with bases, are canary yellow and set on a tough compact reddish matrix, either sprinkled separately over the surface or clustered in shallow cavities. The entire shipment consists of considerably more than a hundred cabinet specimens with a few larger shelf specimens.

1½x2 to 2x3 inches, 50c., 75c. Larger $1.00 to $12.50.

Small speciments and fragments for the microscope, 10c. to 25c.

SELENITE CRYSTALS FROM OHIO.

Several thousand of these sharp, transparent gypsum crystals are now in stock, including some showing the rhombic-formed white phantom. From this large lot we were enabled to get a number of the rare cruciform twins. Sometimes these have one acute termination (see figure,) with the notch on one side. Others have both ends formed of the vicinal faces, which make it resemble a right prism, with notches on each side. Very rarely the included phantom, which follows the twinning structure, comes together in two points resembling an X, forming the *hour-glass phantom twin.*

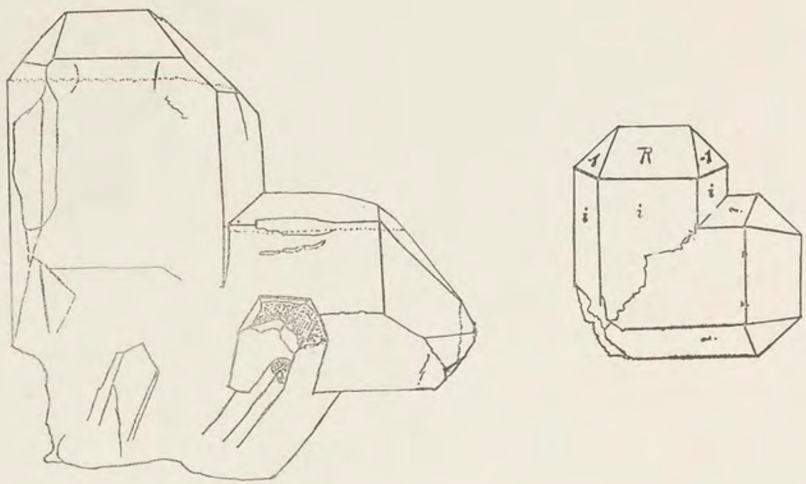
Simple crystals, 5c. to 35c.; 6 small sharp crystals, 25c.; phantoms, 10c., 15c.

Twin crystals, 25c. to $1.50; hour glass phantom twins, $1.00 to $2.00.

A REMARKABLY LARGE TWINNED QUARTZ CRYSTAL.

A number of small quartz twins were received during the year, showing the "right-angled" mode of twinning. Twinning *structure* in quartz is not at all uncommon, but a twin, perfectly apparent, with re-entrant angles is exceedingly rare and interesting. These contact twins are according to the third law, with the rhombohedral plane 1122 as the twinning plane. In all cases the prismatic planes were striated horizontally and in some cases the composition line was stepped, with an occasional overlapping angle, as seen in the figure

PLATE III.

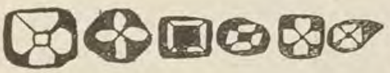


JAPANESE TWINNED QUARTZ CRYSTALS.

of the smaller crystal (Plate III.) All the crystals were transparent, and very much flattened, sometimes clouded with white "feathers" along the rhombohedral cleavage planes.

Recently an extraordinarily large quartz twin was received from Japan, measuring exactly $2\frac{5}{8}$ inches each way. The larger figure is an exact reproduction with the exception that the terminal edges are nicked in the original specimen. The rhombohedral cleavage planes show distinctly in several places. When sent, the twin crystal was attached to a small group of simple crystals but they were unfortunately broken off in transport. The smaller twins occur in a decomposed tertiary sandstone.

CHIASTOLITE FROM MASSACHUSETTS.



Chiastolite or Macle occurs in "stout crystals having the axis and angles of a different color from the rest, owing to a regular arrangement of carbonaceous impurities through the interior, and hence exhibiting a colored cross, or tesselated appearance in a transverse section." This very peculiar and interesting variety of andalusite is named from the Latin, *macula, a spot*, and alludes to the use of the word "mascle" in heraldry, in which the word signifies *a voided lozenge* or a rhomb with open centre. A dealer, who seems to know a little more French than crystallography, has put it in his list of twins. Chiastolite is from *chiastos, arranged diagonally*, and hence from *chi*, the Greek name for the letter X.

Stout, prismatic crystals, with somewhat of a squarish shape, but much rounded and occasionally notched corners, occur in some quantity in Lancaster township, Massachusetts, and also just across the line in Sterling township. The gangue rock or matrix is a tough, dark, compact slaty schist, the chiastolite crystals appearing as thick round pencils penetrating or protruding from it.

Over 500 specimens of this interesting variety were received by us during the past summer, single crystals and matrix specimens and cut polished to bring out the contrasting colors. Also a number of complete natural crystals, which give no hint of the peculiar internal structure. Some of the latter we have had dissected to show the variation of the sectional appearance of one end in comparison with the other in a single crystal.

Polished sections, showing internal structure, 15c., 25c., 35c.

Polished crystals in the schistose matrix, 25c., 35c., 50c., 75c.

Some of these show several polished crystals sometimes two sections of the same crystal.

Single dissected crystals, three, four, or five pieces (with four, six or eight polished sectional surfaces,) 75c., $1.00.

Natural crystals, 2 to 4 inches long, 15c., 25c.

METEORITES.

"Meteorites may be conveniently arranged in three classes, which pass more or less gradually into each other: the first includes all those which consist mainly of iron, and have, therefore, been called *Siderites*, (*sideros*, iron); the second is formed of those which are composed chiefly of iron and stone, both in large proportion, and are called Siderolites; while those of the third class, being almost wholly of stone, are called *Aerolites*, (*aer*, air and *lithos* stone)."—*L. Fletcher*.

The Canyon Diablo Meteoric Iron The Discovery of Diamonds in Its Composition.

BY GEO. F. KUNZ AND DR. O. W. HUNTINGTON.

"The discovery of diamonds in the Canyon Diablo meteoric iron was first announced in this Journal for July, 1891. It was found in the cutting of this meteorite that it was of extraordinary hardness, a day and a half of time being consumed and chisels destroyed in the process of removing a section. In cutting, the chisels had fortunately gone through a crevice filled with small cavities. The emery wheel used to polish this surface was ruined, and on examination the exposed cavities were found to contain hard particles which cut through polished corundum as easily as a knife cuts gypsum. The grains exposed were small and black, and Prof. Geo. A. Koeing pronounced them diamonds because of their hardness and indifference to chemical agents. The extreme hardness was subsequently verified by one of us (G. F. Kunz) who carefully examined the type specimen.

On July 8, 1892, Dr. Huntington gave the result of his experiments with this remarkably interesting Canyon Diablo iron. Taking one hundred grains of the iron he placed it in a perforated platinum cone suspended in a platinum bowl filled with acid, the cone being

PLATE IV.

FRONT.

BACK.

CHIASTOLITE, LANCASTER, MASS.

Two views of the same specimen, showing the variation in pattern of two cross-sections of the same crystal.

made the positive pole and the dish the negative pole of a Bunsen cell. The iron was slowly dissolved, leaving on the cone a large amount of black slime. This was carefully collected, digested over a steam bath for many hours, first with aqua regia and afterwards strong hydrochloric acid. A considerable part of the residue disappeared, but there remained a small amount of white grains which resisted the action of the acids. These particles, when carefully separated by hand, had the appearance of fine beach sand. Under the microscope they were found to be transparent and of brilliant lustre. One of these grains was then mounted upon a point of metallic lead, which, when drawn across a watch crystal, was found to give the familiar singing noise characteristic of a glass cutter's tool and with the same result, namely, cutting the glass completely through. It deeply cut glass, topaz, and a polished sapphire.

One of us (G. F. Kunz) suggested that, if enough of the clear grains could be obtained to polish a diamond, it would conclusively prove that the material was diamond. After enough material had been separated by Dr. Huntington, on Monday, September 11, 1893, through the courtesy of Messrs. Tiffany & Co., we were enabled to try the desired experiment in their diamond cutting pavilion in the Mining Building of the World's Columbian Exposition, they having prepared a new skaif or wheel. At 9.20 a cleavage weighing five thirty-seconds of one carat was set with solder in the metal dop which was placed on the wheel. The wheel was then charged with the residue from the meteorite (the powder mixed as usual with oil) The moment that the diamond was placed on the wheel a hissing noise was apparent, showing to an expert that the material was really cutting the diamond. At 9.23 a flat surface measuring 3 mm. by 1 mm. had been ground down and polished. At 9.30 a small crystal with a natural face up was set in the metal dop. The cutting was very slow for a time, as the natural face of a diamond is always exceedingly hard. The position of the stone was then slightly changed, and a face measuring 2mm. by 1 mm. was ground on the stone and cut. Three minutes later the surface had been cut down somewhat and a decided polish was produced on the triangular face, which was 3 mm. by 1.25 mm. The entire time of this experiment was 15 minutes. The two experiments having been made with great care with both of us present, we cannot hesitate to pronounce the substance diamond or a substance with the same hardness, color, lustre and brilliancy." Am. Jour. Sc., Dec. 1893.

Complete Canyon Diablo Meteorites, 75c., $1.00 to $2.50.

THE PALLAS IRON.

"This irregular mass, weighing about 1500 lbs., of which the greater part is still in the Museum at St. Petersburg, was met with at Krasnojarsk by the traveller Pallas in the year 1772, and had been found in 1749 by a Cossack on the surface of the highest part of a lofty mountain between Krasnojarsk and Abakansk in Siberia, in the midst of a schistose district: it was regarded by the Tartars as a 'holy thing fallen from heaven.' The interior is composed of a ductile iron, which, though brittle at a high temperature, can be forged either cold or at a moderate heat; its large sponge-like pores are filled with an amber-coloured olivine; the texture is uniform and the olivine equally distributed; a vitreous varnish has preserved it from rust."—*L. Fletcher.*

A number of complete individuals from a meteoric "shower" and belonging to this peculiar olivine bearing variety were found in 1886 at Brenham, Kiowa Co., Kansas, over forty of which we have in stock.

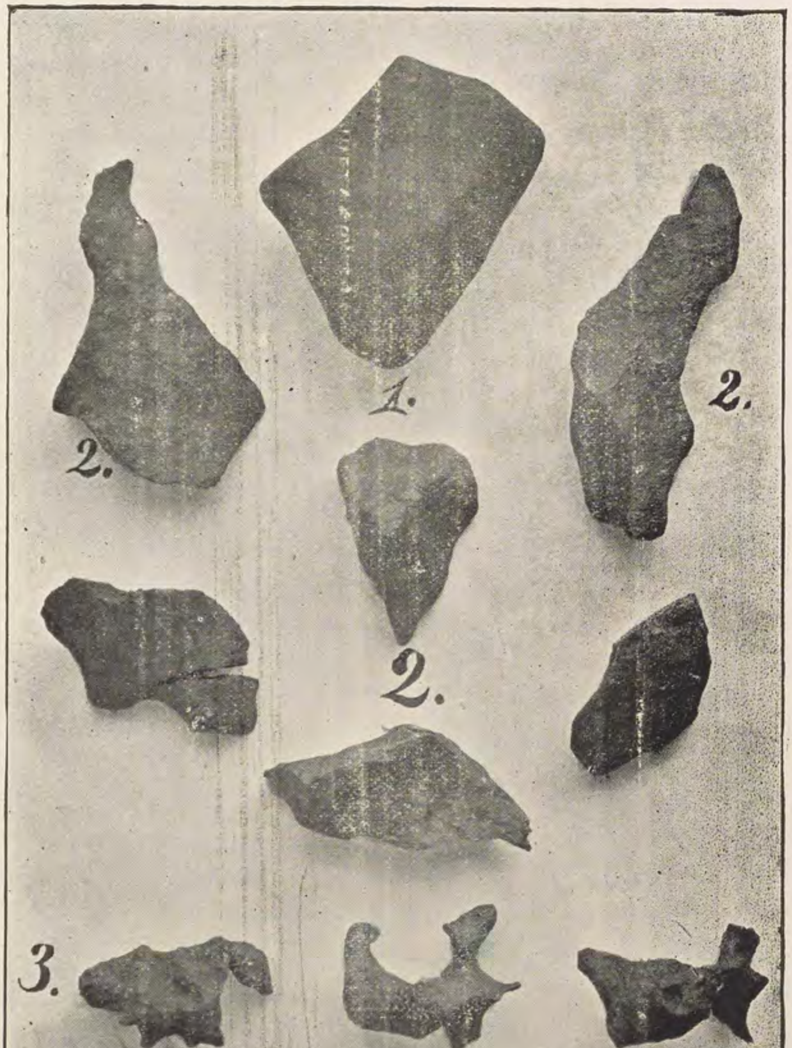
Pallasites, Brenham, Kansas, complete, with printed label, 75c., $1.00, $1.25.

THE TUCSON METEORITE.

"This meteorite, weighing 1,400 pounds, was first discoverd in Sonora, Mexico, by Jesuit missionaries by whom it was considered a great curiosity, exciting much speculation as to its origin. In 1735 the 'Gran Capitan de las Provincias del Occidente,' Don Juan Baptista Anza, was induced to visit the ærolite, and found it at a place called 'Los Muchachos,' in the Sierra Madre, and struck with its appearance undertook to transport it to San Blas, then the nearest point of entry, with the view of carrying it to Spain. With this object it was brought as far as the Presidio, near Tucson, in Arizona, where it was left on account of the difficulty in carrying it further. It was then taken into the town of Tucson, set up vertically, and used as a kind of anvil. In 1857 Dr. B. J. D. Irwin found this meteorite lying in one of the streets of the village, half buried in the earth. As no one claimed it, he publicly announced his intention to take possession of it and forward it to the Smithsonian Institution.

The meteorite is in the shape of an immense signet ring, much heavier on one side, where it is nearly flat on its outer surface, and presents the face used as an anvil. The weight is 1,400 pounds. Its composition is principally of iron. The Couch meteorite was brought from Saltillo by Lieutenant, now General, Darius N. Couch,

PLATE V.



METEORITES.

1. Aerolite, or Meteoric Stone, Moes, Transylvania, Austria-Hungary.
2. Siderites, or Iron Meteorites, Canon Diablo, Arizona.
3. Siderolites, (Pallasites.), Brenham, Kiowa Co., Kansas.

of the United States army. It was said to have come from the Sancha estate, about fifty miles from Santa Rosa, in the north of Coahuila. This meteorite, when discovered, was also in use as an anvil."—*Guide to Sm. Inst.*

Spear-Head Markasite Twins from Sayreville, N. J.

BY ROY HOPPING.

On the trip of the New York Mineralogical Club to Sayreville, Labor Day, Sept. 5th, a visit was made to the clay-pits south of the Raritan River at that place. The clay is used almost entirely for brick-making, one pit, however, refining the clay for the manufacture of pottery elsewhere. Among the minerals found are nicely crystallized pyrite balls, clay-iron-stone in geodes, and also lignite of a velvety black color showing the original wood-structure. Heretofore markasite has not been positively reported from there as no crystals have been found. The ease with which the poorer massive concretions decomposed was evidence, however, of its presence.

In one of the pits Mr. Francis Dewson, of Orange, discovered a small twin crystal which I recognized at once as resembling the markasite twins of Folkstone, England. This crystal was attached to limonite, but subsequent investigation tends to show its position to be accidental. A continuous seam containing numerous small crystals, with occasionally larger ones, extended nearly 20 feet along the bedding, about breast high, and 7 to 10 feet from the surface. The soft but sticky clay made it easy to remove them.

When Mr. Manley's attention was drawn to them he mentioned that he had found several about three months before and later in the day we saw these specimens mounted on crystal clips in his collection. They were not so flat as the other specimens but more stepped and branching, the serrated ridge along the line of the composition plane being nearly as prominent as the other part of the crystal, and resembling somewhat the Guanajuato markasite crystals.

The twinning is prismatic, twinning plane *m*, repeated, producing fivelings. The shape in many cases is a pretty little spear-head and the German name for this twinning is *Speerkies*. They occur near Karlsbad, Bohemia, Austria-Hungary, "in the plastic clay of the brown coal formation." I have never seen specimens from here, but am inclined to think they are quite small. At Folkstone the matrix is a clay sandstone or sandy clay, quite firm after exposure, which allows cabinet specimens to be preserved. In this deposit the crystals are larger than at Sayreville, but the formation in which they are found is similar. An interesting comparison is that the crystallized balls or concretions are markasite at Folkstone and pyrite at Sayreville in large brilliant, but curved cubo-octahedrons.

The centre of the spear-heads, as mentioned above, is sometimes occupied by a serrated ridge extending along the line of the composition plane, but the formation is always irregular. The centre of the flat fivelings is sprinkled with small brilliant crystals, which under the pocket lens proved to be markasite also, some twinned and some apparently simple. Wherever one of these vertical crystals was large enough to be distinctly compared it seemed to be in a twinning position with the other crystal twin not on the *m* plane, *but the geniculated twin, twinning plane e*. The drusy aggregation will not allow of verification.

No reference can be found of the spear-head repeated twinning ever being found in America before, and much credit is due to Mr. Manley's energy in working this locality.—*The Mineral Collector*, Nov., 1898.

Spear-head twins, loose, 10c., 5c.

SULPHUR BALL PYRITES.

Iron pyrites or pyrite is sulphuret of iron and is of no use whatever except for the purpose of making sulphuric acid. For this purpose it is used extensively. It occurs in crystals and is bright brass yellow. The early Jamestown colonists sent a cargo of it back to England, thinking it was gold ore. It has long been called *Fool's Gold.*

We have at present over 300 showy specimens of these pyrite specimens ranging according to size from 10c. to 25c. A small quantity of fine large ones at higher prices. For brightening a cabinet or exhibition before a class no better specimen can be had.

THE ZEOLITES

AND ASSOCIATED MINERALS FROM THE NEW JERSEY TRAP FORMATION.

For over six months during the period when the quarry at Paterson was producing the finest material, we received the entire output. There are probably but few really fine specimens of the many taken out that were not procured from us as the inspection of any large collection will show. All other dealers, also, either directly *or indirectly* in America as well as in Europe, received their stock through us. We are therefore justly considered headquarters for the zeolites and interesting associated minerals of the New Jersey trap formation. All new openings are known to us first and now that Paterson and Guttenberg are permanently closed, some of these specimens are becoming scarcer. We have, however, an enormous stock and in some instances, as Caldwell prehnite, have procured fine new lots from localities not generally known, yet occasionally producing fine material.

On the Occurrence of Thaumasite at West Paterson, N. J.

BY S. L. PENFIELD AND J. H. PRATT.

"In 1878 Baron Von Nordenskiold described a mineral from the copper mines of Areskuta, Jemtland Sweden, which, according to the analysis of Lindstroem, had the composition $CaSiO_3, CaCO_3, CaSO_4, 14H_2O$ and to which the name thaumasite was given, from *thaumasein*, to be surprised. The mineral was not found in distinct crystals but was crystalline and on a fracture showed a fine fibrous structure.

That a mineral with such a remarkable composition was capable of existence was not accepted by all mineralogists, and Bertrand on examining thin sections of it with the microscope was led to believe that it was a mixture.

The idea of Bertrand's that thaumasite was a mixture was not accepted by Nordenskiold. Specimens were moreover sent to Lacroix for renewed optical examination, and in a letter to Nordenskiold he states that the mineral was found to be practically homogeneous, and Bertrand in a letter to Nordenskiold withdrew his objection.

It is with pleasure that the authors are able to announce the discovery of this unusually interesting mineral at Burger's quarry, West Paterson, New Jersey. The mineral occurs as an aggregate of prismatic crystals, sometimes so loosely held together that the individ uals crush between the fingers, while more often the masses are firm and have somewhat the appearance of white alabaster. Some of the masses showing fine prismatic crystals have a decidedly silky lustre. There is a distinct prismatic cleavage. Measurements were only possible in the prismatic zone and approximated to 60 degrees, which determine the crystallization as hexagonal."—Am. Jour. Sc., Mar. 1896.

The result of three analyses gave the formula $CaSiO_3,CaCO_3,$ $CaSO_4,15H_2O$. Lindstroem really found over fourteen and a half molecules of water. The amount of water is remarkable, being 42.77 per cent. The determination of the system of crystallization from well formed crystals, places the mineral beyond a doubt as a distinct species, adding greatly to the interest manifested on account of its remarkable composition.

The entire output of Mr. Burger's quarry was received by us for over six months of its most productive period and included several hundred pounds of elegant thaumasite.

Massive alabaster-like specimens, cabinet size, 25c. to 50c.; crystalline masses, an aggregation of crystals, but not friable, 50c. to 75c., the exceedingly rare silky variety in distinct crystals, on quartz; pectolite, etc., 75c. to $2.00.

APOPHYLLITE FROM PATERSON.

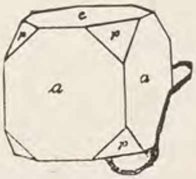
The crystallized specimens of apophyllite from Burger's quarry are the most beautiful from any locality. The crystals are short and stout resembling cubo-octahedrous or flat, set on edge. The pearly basal planes and bright striated prismatic planes are seen nicely on these specimens, the large white crystals being nicely set on drusy quartz with a trap base.

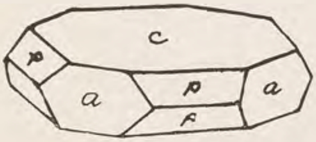
Fine large matrix specimens, 50c., 75c. Choice small specimens, 20c. to 35c.

PREHNITE FROM CALDWELL.

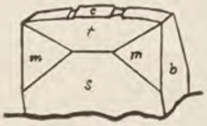
To add to our already fine stock of green botryoidal prehnite speci mens we recently procured the entire lot of a new find at Caldwell, some three miles below Paterson, in the same formation. The color

PLATE VI.





APOPHYLLITE.



HEULANDITE.

STILBITE.

PATERSON ZEOLITES.

is fully as good as the best from Hoxsey's quarry and in many instances the crystalline structure is in distinct curved ridges. Small specimens from either locality, 15c., 20c., 25c. Large fine cabinet specimens, 35c. to 75c.

A large lot of flat and cavity specimens of bright blue-green prehnite has been procured from Guttenberg (sometimes called Woodcliff) of excellent color, 10c. to 25c.

STILBITE IN STRIATED CRYSTALS.

Among the large number of light brown sheaf specimens a very small lot of about 50 specimens of the Paterson stilbite, showed crystals in distinct terminated crystals, thick and deeply striated. They occur in thickly set masses usually in cavities and are very much better than from Nova Scotia or other localities. The terminating planes are large, sharp and bright. Large cabinet specimens, 25c., 35c., 50c.

Our large stock of sheaf stilbites and other forms allows us to sell them at remarkably low prices. Excellent cabinet specimens, 15c. to 35c.

OTHER MINERALS FROM THE NEW JERSEY TRAP.

Among the other minerals, too numerous to mention more fully, we have from Guttenberg a large lot of the fine Pectolite *in distinct free crystals* bunched in cavities on prehnite, very fine, 75c. to $5.00; laumontite and apophyllite sprinkled over prehnite, natrolite radiated and bunched on prehnite, 10c. to 25c.; from Paterson fine radiated pectolite, 10c. to 75c., and fine botryoidal specimens, fine large balls, 75c. to $1.50; heulandites, pearly white, sharp, clean and nicely modified, showing curved pearly interrupted prismatic planes, 10c. to 75c.

AGATES.

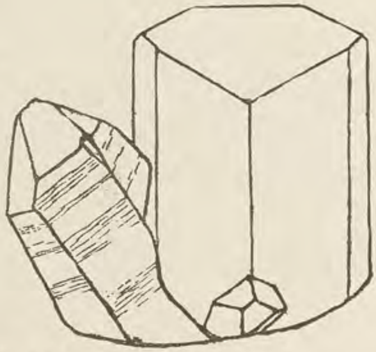
We have at present over 100 polished agates in stock from Brazil and India. The Brazilian agates are generally banded white, black, red, etc., as ribbon agates, fortification, or bull's eye varieties. The specimens from India are all green moss agates.

Banded agates from Brazil, polished, 15c., 25c., 35c., 50c. A few finer ones, 75c. to $2.00.

Moss agates, India, polished, 25c., 35c., 50c.

"The bands are the edges of layers of deposition, the agate having been formed by a deposit of silica from solutions intermittently supplied, in irregular cavities in rocks, and deriving their concentric waving courses from the irregularities of the walls of the cavity. As the cavity cannot contain enough of the solution to fill it with silica, an open hole has been supposed to be retained on one side to permit the continued supply; but it is more probable that it passes through the outer layers by osmoses, the denser solution outside thus supplying the silica as fast as it is deposited within. The colors are due to traces of organic matter, or of oxides of iron, manganese, or titanium, and largely to differences in rate of deposition."

AMAZONITE FROM COLORADO.



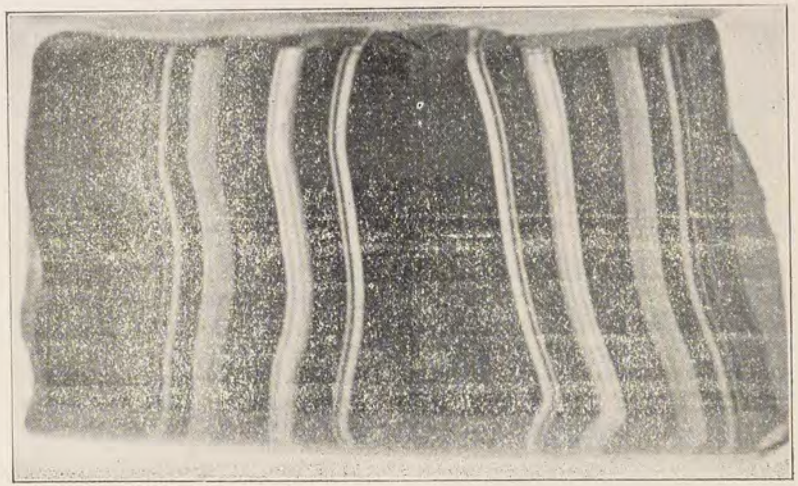
Amazonite or amazon stone occurs in the granite of Pike's Peak in large, stout, blue-green crystals. It resembles the common feldspar, orthoclase, in its habit but the crystals are triclinic instead of monoclinic, and it is classed on that account as a separate species. We have just received over 725 groups and single crystals, some associated with smoky quartz.

Small stout crystals, sharp and bright, 10c., 15c., 20c.

Large groups and single crystals, 25c., 35c., 50c., 75c. and $1.00.

Nearly 1000 smoky quartz crystals from the same locality, incorrectly called "smoky topas," were procured averaging 1 to 3 inches in length, 10c., 15c., 25c.

PLATE VII.



RIBBON AGATE, BRAZIL.

SYSTEMATIC COLLECTIONS.

THE ALPHA COLLECTION.

The Alpha set consists of twenty-five common minerals accompanied by Mrs. Ellen H. Richards' 46 page pamphlet FIRST LESSONS ON MINERALS, published by the Boston Society of Natural History as a guide to science teaching in the grammar grades of the public schools for *observation lessons* or *nature study*. The specimens are pretty and attractive as well as typical, encouraging a boy's or girl's faculty of observation and increasing their knowledge of the physical properties of inorganic substances. The book was specially designed for teachers' use and the language is clear, concise and not burdened with scientific terms. Each specimen is described, compared with the others, the simple physical tests suggested, the properties of the mineral listed and the uses given, which, in many instances, depend on the physical properties.

As Prof. Crosby says in the introduction: "Teachers should at the outset free their minds of the idea that mineralogy is a vast undertaking. These few common minerals are, in one sense, among the most familiar objects of every-day life, and yet how few children and grown people know anything definite about them. There is no other direction in science where so little work will make the pupil master of so much ground as in the direction of the elementary study of minerals."

THE ALPHA COLLECTION.

1. Copper, Lake Superior.
2. Sulphur, Sicily.
3. Graphite, Ceylon.
4. Limonite, Edge Hill, Pa.
5. Hematite, Clinton, N. Y.
6. Magnetite, Essex Co., N. Y.
7. Quartz Crystal, Arkansas.
8. Milky Quartz, Berks Co., Pa.
9. Smoky Quartz, Pike's Peak Col.
10. Amethyst, Paterson, N. J.
11. Chalcedony, Berks Co., Pa.
12. Agate, polished, Brazil.
13. Flint, Dover Cliffs, Eng.
14. Jasper, Berks Co., Pa.
15. Pyrite, Sayreville, N. J.
16. Galenite, Hampshire Co., Mass.
17. Rock Salt, Ellsworth Co., Kan.
18. Calcite, Joplin, Mo.
19. Chalk, Dover Cliffs, Eng.
20. Onyx Marble, Mexico.
21. Gypsum, Grand Rapids, Mich.
22. Selenite, Ellsworth, Ohio.
23. Orthoclase, (Feldspar) Delaware Co., Pa.
24. Muscovite, (Mica) N. C.
25. Hornblende, Canada.

[OVER

25 specimens 2x3 inches, with printed labels, numbered and with book, $3.00.

25 specimens 1½x2 inches, with printed labels, numbered and with book, $2.00.

25 specimens 1x1½ inches, in trays and wooden box with list numbered and with book, $1.00.

Richards' FIRST LESSONS ON MINERALS, extra copies, postpaid, 10c

MINERALS AND HOW TO STUDY THEM.

"The mineralogist must first of all use his eyes and other unaided senses in studying minerals; in other words, he must gain all the information he can about minerals by looking at them and handling them. If he learns to do this wisely, he will be surprised to find how keen his senses become and how much he can find out.

"The trained eye of the mineralogist will show him, first of all, the *form* of the mineral, as to whether it has the regular geometrical shape of a crystal or not, or is simply granular, fibrous, and so on. It will show him whether it has the natural, easy, smooth fracture of many crystallized substances, called *cleavage*, or only the fracture of ordinary kinds. It will tell him, too, what peculiarities of *luster* the surface of a mineral presents, depending upon the way in which it reflects light, whether metallic, glassy, greasy, or silky, and so on; also what the *color* is, whether it is transparent or opaque, and many other points.

"The *touch* will show whether the 'feel' is greasy, as is true of a few very soft minerals, or harsh, as are the majority. Again, a mass in the hand will often be recognized at once as heavy or light as compared with familiar substances of the same appearance. Thus the common minerals, quartz, feldspar, calcite, have nearly the same density, and one can easily become so accustomed to them that a piece of gypsum seems light, and one of barite (heavy spar) seems heavy.

"The *taste* may sometimes tell, for instance, that rock salt is in hand, while the *odor* is occasionally a useful character, as the clayey odor of some minerals when breathed upon.

"When the senses alone stop, simple tests to aid them come in. A touch upon the smooth surface of a mineral with the point of a knife serves to show whether it is relatively soft or hard. The color of the powder obtained by scratching with the knife or upon a plate of rough porcelain or ground glass, called the *streak*, is sometimes quite different from that of the surface, and in such cases this is a very important character."—DANA'S *Minerals and How to Study Them.*

THE STUDENTS COLLECTION.

1. **Graphite** or "Black Lead," metallic black, foliated, greasy, very soft.
2. **Sulphur, native,** resinous yellow, brittle, burns easily with a pale blue flame and suffocating odor.
3. **Copper, native,** metallic red, malleable, ductile.
4. **Chalcopyrite** or Copper Pyrites. metallic golden yellow.
5. **Galenite,** or Galena, metallic lead-gray, perfect stepped cubic cleavage.
6. **Pyrite** or Iron Pyrites, brilliant metallic brass-yellow, cubic crystallization, "sulphur ball" concretion, greenish-black streak.

   Pyrite strikes fire with steel, giving a sulphurous odor. The hardness of pyrite is No. 6, while the more golden yellow chalcopyrite is No. 4.

7. **Hematite** or Red Iron Ore, ocherous red, oolitic, argillaceous odor, dark red streak.
8. **Magnetite** or Magnetic Iron Ore, metallic black, crystalline granular, magnetic.

   Magnetism is the power of being attracted by a magnet and is possessed by iron and steel. The magnetic polarity of a magnet is retained by hardened steel, when electrically polarized, and will attract magnetic substances. Lodestone, a variety of magnetite, is a *natural* magnet.

9. **Limonite** or Brown Iron Ore, submetallic, black, yellow-brown streak.

   Limonite, when strongly heated, loses its water, changing to the anhydrous red oxide of iron, hematite, with a reddish streak.

10. **Sphalerite** or Zinc Blende, resinous brown, perfect dodecahedral cleavage, yellowish white streak.
11. **Corundum,** adamantine-gray, tough. hardness 9.
12. **Emery,** fine crystalline granular.
13. **Fluorite** or Fluor Spar, light green, semi-transparent, perfect octahedral cleavage, hardness 4.
14. **Calcite,** or Calc Spar, translucent yellow, perfect rhombohedral cleavage, hardness 3.
15. **Dog Tooth Spar,** acute scalenohedral crystal.

16. **Mexican Onyx Marble,** polished, banded white, compact.

17. **Stalactite,** stalactitic.

18. **Chalk,** dull white, amorphous, argillaceous odor.

19. **Aragonite** or Satinstone, satin white, fibriform.

Aragonite and calcite are identical in composition, both being calcium carbonate, but the molecular structure differs, distinguished by a density of 2.8 for calcite and 2.9 for aragonite, and rhombohedral crystal forms and cleavage for calcite and prismatic crystal forms and cleavage for aragonite.

20. **Apatite,** brown hexagonal crystal, basal cleavage, brittle, hardness 5.

21. **Gypsum,** flesh red, soft.

22. **Selenite,** transparent pearly, perfect prismatic cleavage, flexible, sectile, hardness 2.

23. **Dolomite** or Pearl Spar, cream-white, curved rhombohedral crystals, pearly.

Dolomite and calcite both occur in rhombohedral crystals with perfect cleavage. Calcite is calcium carbonate and includes the ordinary limestones; dolomite is magnesium calcium carbonate and includes the magnesian limestones.

24. **Barite** or Heavy Spar, heavy white, crystalline cleavable.

25. **Halite** or Rock Salt, native, transparent, perfect cubic cleavage, salty taste, cold feel, melts, soluble.

26. **Quartz,** double-ended white crystal.

27. **Rock Crystal,** colorless transparent striated crystal, hardness 7.

28. **Smoky Quartz,** smoky brown tapering crystal.

29. **Amethyst,** purple quartz.

30. **Milky Quartz,** vitreous white.

31. **Rose Quartz,** translucent rose-red.

32. **Chalcedony,** glimmering translucent gray.

33. **Agate,** polished, variegated.

34. **Jasper,** opaque yellow, compact.

35. **Flint,** smoky black, chalk rind, sub-translucent, nodular, conchoidal fracture, strikes fire with steel.

36. **Geode,** geodic or hollow concretionary.

The varieties of quartz illustrate different colors, from white and colorless to black and variegated; and transparency from perfectly transparent to opaque.

37. **Wax Opal,** waxy reddish-yellow, light.

38. **Orthoclase** or Common Feldspar, pale yellow, perfect basal and prismatic cleavages, hardness 6.

"The name is from two Greek words, (*orthos*, *erect*, and *klasis*, *fracture*,) referring to the existence of the two prominent cleavages at *right angles* to each other."

39. **Amazonite** or Green Feldspar, bright blue-green, cleavable.
40. **Albite** or Soda Feldspar, pearly white, lamellar.
41. **Hornblende,** jet black, cleavable.
42. **Beryl,** vitreous bluish-green, hardness 8.
43. **Garnet,** red-brown dodecahedral crystals, hard.
44. **Muscovite** or Common Mica, transparent glistening white, micaceous, perfect basal cleavage, elastic.

Sheet mica, when speared with a dull awl or knife-blade, forms a six-rayed *percussion figure*, or star, revealing the hexagonal structure.

45. **Biotite** or Black Mica, brilliant opaque black-micaceous, elastic.
46. **Tourmaline,** columnar crystals, very brittle.

Quartz, the feldspars, the micas and hornblende are the rock-making minerals of the granites, gneiss, etc., in which beryl, garnet, tourmaline and rarer minerals are often found.

47. **Talc,** foliated green, pearly, flexible, hardness 1.
48. **Soapstone,** translucent greenish-white, soft.
49. **Serpentine,** oily yellowish-green, white streak.
50. **Chrysotile,** silky fibrous serpentine.

The above is used almost exclusively as *asbestos*, the trade name for the rare variety of amphibole, *asbestus*.

50 specimens, 1½x2 inches, numbered and with printed labels, $3.00.
50 specimens, 2x3 inches, numbered and with printed labels, $5.00.
Dana's MINERALS AND HOW TO STUDY THEM, $1.20; postpaid, $1.30.

THE PHYSICAL PROPERTIES ILLUSTRATED BY THE STUDENTS COLLECTION.

COLOR.

The first thing that attracts the attention of the most superficial observer of a mineral specimen is the color, and the color of many minerals is so characteristic as to have the name of the mineral as a qualifying word attached to the common name of the color. Sulphur-yellow, coppery-red, lead-gray, iron-black, ocher-red, chalk-white and golden are in every-day use. The effect of the names of colors on the names of minerals is equally apparent, especially in naming varieties, as for instance, smoky quartz, milky quartz, rose quartz; and also hematite, from the Greek work, *blood*; albite, from *albus*, white; etc.

LUSTER.

Intimately related to color is luster. Color is the kind of light reflected and luster is the manner in which it is reflected. The luster of the metals and many ores is peculiar and therefore is named *metallic luster.* Copper, chalcopyrite and galenite (3, 4, 5,) are good examples with various colors. When of low degree of brilliancy it is said to be *sub-metallic*, as seen with limonite (9).

Unmetallic lusters are more numerous. *Resinous luster* is that of common rosin and is seen in native sulphur (2) and sphalerite or zinc blende (10). *Adamantine luster* is a brilliant oily luster possessed by a very few hard minerals such as diamond and corundum (11). A *silky* or *satin luster* is peculiar to fibrous or fibriform minerals such as satinstone (19) and chrysotile (50). *Pearly luster* is common where a species has a perfect cleavage or foliated structure allowing of partial separation into thin plates. These properties will be noticed with selenite (22), pearlspar (23), albite (40), muscovite (44) and talc (47) *Greasy luster* may be *waxy*, as wax opal (36) or *oily*, like that of noble serpentine (49).

Vitreous or *glassy luster* is illustrated best by the crystalline varieties of quartz on a broken surface, as seen in common white quartz (30).

A few earthy, amorphous minerals have no luster at all. They are then said to be *dull*. This is the case with chalk (18). Some, also, show but slight lustre due to a very compact crystalline structure. This is the case with the cryptocrystalline varieties of quartz, chalcedony (32), jasper (34) and flint (35).

TRANSPARENCY.

A perfectly transparent mineral allows the light to pass through it without hindrance and is perfectly colorless. When absolutely no light can pass through it is said to be opaque. A rough or fractured surface tends to destroy transparency, therefore a perfect cleavage or smooth crystal plane is necessary for perfection. A colored mineral absorbs part of the light and is therefore not perfectly transparent. The degrees from transparent to opaque are shown as follows:

Transparent: 27. Rock Crystal, colorless crystallized.
Semi-transparent: 13. Fluorite, green crystalline.
Translucent: 32. Chalcedony, gray cryptocrystalline.
Sub-translucent: 35. Flint, black cryptocrystalline.
Opaque: 34. Jasper, yellow cryptocrystalline.

STREAK.

When a mineral is powdered with a hammer or used to make a mark on white porcelain or ground glass, the color of the powder or that of the mark is called the *streak.* Amorphous and foliated minerals generally have a streak nearly the same color as the mineral itself as graphite (1), hematite (7) and chalk (18). In the metallic minerals it usually destroys the luster and the color is darker as galena (5), dark gray and pyrite (6) greenish black. Many unmetallic minerals, colorless and of various colors have a white streak and only a few minerals have a characteristic streak noticeably different from the color as brown sphalerite (10) with a yellowish white streak and green serpentine (49) with a white streak.

STRUCTURE AND FORM.

The following specimens are examples of important kinds of structure and form:

Stalactitic or pendent, stalactite, (17).
Geodic or hollow concretionary, geode, (36).
Concretionary, "sulphur ball" pyrite, (6).
Nodular or lobed concretionary, flint, (35).
Oolitic or small concretionary, hematite, (7).
Columnar, tourmaline in quartz, (40).
Fibriform or fine columnar, satinstone, (19).
Fibrous or fine columnar, separable, chrysotile, (50).
Lamellar or in layers, albite, (40).
Foliated, in separable layers, talc, (47).
Micaceous, easily separable, muscovite, (44).
Crystalline, coarse, barite or heavy spar, (24).
Coarse crystalline granular, magnetite, (8).
Fine crystalline granular, emery, (12).
Cryptocrystalline, microscopic, chalcedony, (32.)
Amorphous, without form, chalk, (18.)

CRYSTAL FORMS.

When a mineral forms in distinct crystals, the forms are divided into six systems; the isometric or cubic, the tetragonal, hexagonal and orthohombic (right prismatic), the monoclinic and triclinic, (oblique prismatic). The following forms and combinations are represented:

6. Pyrite, cubo-octahedral.
43. Garnet, dodecahedral.
20. Apatite, hexagonal prism.
26. Quartz, doubly-ended prism.
27. Rock Crystal, terminated prism.
28. Smoky Quartz, tabering prism.
23. Dolomite, rhombohedral.
15. Dog Tooth Spar, scalenohedral.

CLEAVAGE AND FRACTURE.

The broken surface of a mineral is smooth or rough, even or uneven, hackly or splintery, depending on the structure of the material. Rarely a mineral will show a shell like or *conchoidal* fracture, consisting of a series of rings with a common center, as with flint (35). Even fracture is due to a regular crystalline structure, and when this easy fracture is very marked it is called perfect cleavage. The cleavage plane is always a simple crystal plane and the following perfect cleavages are represented :

Cubic, 5. Galenite, 25. Rock Salt.
Octahedral, 13. Fluorite or Fluor Spar.
Dodecahedral, 10. Sphalerite or Zinc Blende.
Rhombohedral, 14. Calcite or Calc Spar.
Basal, 20. Apatite, 44. Muscovite, 45. Biotite.
Prismatic, 22. Selenite, 41. Hornblende.
Basal and Prismatic, at right angles, 38. Orthoclase.

THE SCALE OF HARDNESS.

Soft minerals are quite uncommon as are also very hard minerals. Few minerals are less than three in the scale and those above seven, quartz, are rare, including the gem minerals. For ordinary purposes minerals can be divided into very soft minerals, scratched by the finger nail; soft minerals scratched with a knife; hard minerals, not scratched by a knife; and very hard minerals scratching quartz. The entire scale, except diamond, is as follows :

No. 1. 47 Talc.	No. 4. 13 Fluorite.	No. 7. 27 Quartz.
No. 2. 22 Selenite.	No. 5. 20 Apatite.	No. 8. 42 Beryl,
No. 3. 14 Calcite.	No. 6. 38 Orthoclase.	No. 9. 11 Corundum.

FEEL.

The very soft minerals have a greasy feel as 1 graphite, 47 talc and 48 soapstone.

TENACITY.

When a metal can be flattened by hammering and drawn into wire it is said to be *malleable* and *ductile*. This is the case with native copper (3). When a mineral can be cut with a knife without crumbling it is *sectile*. This is possessed in some degree by selenite (22). If a knife-blade be pushed beneath the folia of talc (47) or graphite (1) they may be bent over, showing their *flexibility*. If the same is done with the micas (44, 45) they may be partially flexed but spring into position again as they possess *elasticity* as well. Some minerals are exceedingly *brittle*, a single light blow from a hammer sending them into fragments, as sulphur (2), apatite (20) and tourmaline (46); while others are exceedingly tenacious or *tough*, as corundum (11).

SPECIFIC GRAVITY.

The relative density of a mineral is only noticeable when lighter or heavier than usual. Calcite, quartz and feldspar are of ordinary density while sulphur (2), selenite (22) and salt (25) are noticeably lighter and barite (24) and the ores, chalcopyrite (4), pyrite (6), etc., are much heavier.

TASTE AND ODOR.

Taste and odor are very exceptional properties, peculiar to but few specimens.

25. Halite or Rock Salt has a salty taste.

18. Chalk, when breathed upon has an argillaceous odor.

2. Sulphur, when burned and 6, pyrite when struck have a sulphurous odor

THE TECHNICAL USES of mineral substances depend upon their physical properties and chemical composition.

Graphite is used for making crucibles and lead pencils ; also as a lubricator. Sulphur in the form of "candles" is an effective disinfectant but the most important uses are the manufacture of sulphuric acid and gun-powder. Iron pyrites is mined almost exclusively for the production of the former. Corundum and its variety emery are extensively used for abrasive purposes. Fluor spar is a most economical flux but calc spar and the limestones are generally used on account of their abundance. Calcite when in perfectly transparent rhombohedrons is called Iceland spar and is of great value, on account of its double refraction, in the manufacture of the optical instruments called Nicol's prisms ; while chalk, the earthy variety, is the whiting of commerce and the base of the school-room crayon.

Apatite is treated with sulphuric acid to form the soluble phosphate fertilizers for agricultural purposes. Gypsum is roasted and ground into plaster of Paris, so-called on account of the extensive manufacture from the gypsum beds of the Paris basin. The transparent pure variety finds a limited use as selenite "plates," an accessory to the microscope. Barite is used as a "body" and a "filler" in the paint and paper trade. Rock salt is extensively mined for man and cattle, also for curing fur-skins. Many of the varieties of quartz are precious and semiprecious stones. Milky quartz is ground for the manufacture of "flint" paper and garnet is also used, when crushed, for abrasive purposes.

The common feldspar orthoclase is quarried for the manufacture of porcelain and recently a very superior vitrified brick has been made by refusion. Muscovite is used for stove doors, battle ships, etc., in place of glass, and the ground material or "mica size" is the "snow" of Christmas cards. Talc and soapstone when ground are used as a "filler" for asbestos paper, for powdering the insides of shoes, as a face powder and other purposes. French chalk or tailors' pencils are of soapstone, while its property of holding heat for several hours is the reason it was used for foot-warmers in the "olden times." It makes a fine lining for fire-places.

Mexican onyx-marble and serpentine, are high grade decorative stones, much used for inside work.

THE ORES.

The chief ores of copper are the native metal and the sulphuret, chalcopyrite, and of iron the three oxides, hematite, magnetite and limonite, although the ocherous varieties or low-grade ore varieties of hematite and limonite are ground for paints and pigments. Galenite is the most important ore of lead, and sphalerite one of the best zinc ores.

The sulphurets and quartz are often rich in gold and silver, and are then mined and smelted for the precious metals as well.

THE CABINET COLLECTION.

This set of minerals consists of a hundred specimens averaging two by three inches, nicely shaped and carefully selected. It is intended for exhibition and comparison. It is very attractive, suitable for a private collection or a school cabinet. All of the specimens included are typical as a glance at the localities will confirm.

The arrangement followed is that of DANA'S *Minerals and How to Study Them* and every species and variety listed will be found described fully in this book under a separate black type heading.

Each specimen is numbered to correspond to the number in the corner of the accompanying neatly printed labels.

THE CABINET COLLECTION.

1. Graphite or "Black Lead" on quartz, Warren Co., N. Y.
2. Native Sulphur, near Girgenti, Sicily, Italy.
3. Orpiment, arsenic sulphide, Banat, Hungary.
4. Stibnite or Antimony Glance, antimony sulphide, Warren Co., N. Y.
5. Molybdenite or Molybdenum Glance, molybdenum sulphide, Altenberg, Saxony.
6. Native Copper, Keweenaw Point, Mich.
7. Chalcocite or Copper Glance, copper sulphide, Butte, Mont.
8. Bornite or Peacock Copper Ore, copper iron sulphide, Granville Co., N. C.
9. Chalcopyrite or Copper Pyrites, copper iron sulphide, Rowe, Mass.
10. Malachite, green copper carbonate, Copper Queen Mine, Bisbee, Ariz.
11. Azurite, blue copper carbonate, Copper Queen Mine, Bisbee, Ariz.
12. Galenite or Lead Glance, lead sulphide, Southampton, Mass.
13. Cerussite or White Lead Ore, lead carbonate, Mammoth, Ariz.
14. Cassiterite or Tinstone, tin oxide, Geyer, Bohemia.
15. Pyrite or Iron Pyrites, iron sulphide, Sayreville, N. J.
16. Markasite or Cockscomb Pyrites, Joplin, Mo.
17. Arsenopyrite or Arsenic Pyrites, arsenic sulphide, Freiberg, Saxony.
18. Hematite or Red Iron Ore, iron sesquioxide, Clinton, N. Y.
19. Magnetite or Magnetic Iron Ore, iron oxide, Essex Co., N. Y.
20. Limonite or Brown Iron Ore, hydrous iron oxide, Edge Hill, Pa.
21. Siderite or Spathic Iron, iron carbonate, Roxbury, Conn.
22. Pyrolusite, manganese oxide, Ilmenau, Germany.
23. Rhodonite, manganese silicate, Franklin Furnace, N. J.
24. Sphalerite or Zinc Blende, zinc sulphide, Joplin, Mo.
25. Smithsonite, zinc carbonate, Altenberg, Rhineland, Germany.
26. Corundum, aluminium oxide, Laurel Hill, Ga.
27. Ruby, pink corundum, Burma.
28. Emery, massive granular, Chester, Mass.
39. Cryolite, or Ice Stone, aluminium sodium fluoride, Greenland.

30. Fluorite or Fluor Spar, calcium fluoride, Macomb, N. Y.
31. Calcite or Calc Spar, rhombohedral cleavage, Joplin, Mo.
32. Nailhead Spar, low rhombs, Lawrence Co., S. D.
33. Dog Tooth Spar, scalenohedral, Joplin, Mo.
34. Mexican Onyx Marble, California Peninsula.
35. Stalactite, Copper Queen Mine, Bisbee, Ariz.
36. Chalk, Dover Cliffs, England.
37. Calc Tufa or Petrified Moss, Montgomery Co., Ind.
38. Aragonite, calcium carbonate, Eisenerz, Styria, Austria.
39. Apatite, calcium phosphate, Ontario, Canada.
40. Gypsum, calcium sulphate, Grand Rapids, Mich.
41. Selenite, cleavable, Nova Scotia.
42. Alabaster, massive white, Niagara Falls, N. Y.
43. Satin Spar, silky, Derbyshire, England.
44. Dolomite or Pearl Spar, calcium magnesium carbonate, Niagara Falls, N. Y.
45. Barite or Heavy Spar, barium sulphate, Hampshire Co., Mass.
46. Celestite, strontium sulphate, Ontario, Canada.
47. Strontianite, strontium carbonate, Hamm, Germany.
48. Halite or Rock Salt, sodium chloride, Ellsworth Co., Kans.
49. Quartz Crystal, white, silicon oxide, Suttrop, Germany.
50. Rock Crystal, transparent, near Hot Springs, Ark.
51. Smoky Quartz, crystal, Pikes Peak, Col.
52. Amethyst, purple, Paterson, N. J.
53. Milky Quartz, Berks Co., Penn.
54. Rose Quartz, Bowdoin, Maine.
55. Chalcedony, gray, Berks Co., Penn.
56. Agate, banded, polished, Brazil.
57. Moss Agate, green, polished, India.
58. Carnelian, cut and polished, Brazil.
59. Jasper, yellow, Berks Co., Penn.
60. Flint, black, Dover Chalk Cliffs, England.
61. Wood Agate, silicified wood, near Holbrook, Arizona.
62. Quartz Geode, Lawrence Co., S. D.
63. Opal, precious, hydrous silicon oxide, Queretero, Mexico.
64. Wax Opal, yellow, Veresvagas, Hungary.
65. Orthoclase or Common Feldspar, cleavable, potassium aluminium silicate, Delaware Co., Penn.

66. Twin Crystal, Karlsbad, Bohemia.
67. Amazonite or Green Feldspar, Amelia, Va.
68. Albite or Soda Feldspar, sodium aluminium silicate, Chesterfield, Mass.
69. Augite, crystal, near Bilin, Bohemia.
70. Tremolite, calcium magnesium silicate, Edwards, N. Y.
71. Actinolite, iron amphibole, Huntington, Mass.
72. Hornblende, black amphibole, Ontario, Canada.
73. Beryl, beryllium silicate, Ackworth, N. H.
74. Garnet, precious pyrope, Navajo Reservation, N. M.
75. Almandite garnets, in gneiss, Huntington, Mass.
76. Muscovite or Common Mica, potassium aluminium silicate, New York City.
77. Biotite or Black Mica, Burgess, Canada.
78. Lepidolite or Lithium Mica, Paris, Me.
79. Clinochlore or Chlorite, Chester Co., Penn.
80. Chrysolite or Olivine, magnesium iron silicate, Webster, N. C.
81. Zircon, zirconium silicate, El Paso Co., Colo.
82. Wernerite or Common Scapolite, lilac, Bolton, Mass.
83. Vesuvianite or Idocrase, Sandford, Me.
84. Epidote, Untersulzbachthal, Tyrol, Austria.
85. Tourmaline, Chesterfield, Mass.
86. Rubellite, pink tourmaline, Paris, Me.
87. Topaz, near Simpson, Utah.
88. Titanite, calcium titanium silicate, New York City.
89. Andalusite, variety Chiastolite. polished section, aluminium silicate, Lancaster, Mass.
90. Staurolite or Cross Stone, Grafton Co., N. H.
91. Talc, magnesium silicate, Holly Springs Co., Ga.
92. Soapstone or Steatite, Cherokee Co., N. C.
93. Serpentine, magnesium silicate, Hoboken, N. J,
94. Chrysotile or Fibrous Serpentine, Passaic Co., N. J.
95. Prehnite, calcium aluminium silicate, Guttenberg, N. J.
96. Apophyllite, hydrous calcium potassium silicate, Paterson, N. J.
97. Pectolite, hydrous calcium sodium silicate, Paterson, N. J.
98. Natrolite, hydrous sodium aluminium silicate, Guttenberg, N. J.
99. Stilbite, hydrous calcium aluminium silicate, Paterson, N. J.
100. Heulandite, hydrous calcium aluminium silicate, Paterson, N. J.

100 specimens, 2x3 inches, numbered and with printed labels, $10.00.

Mounted on bevel front black wooden blocks, dull finish, for wall case, $15.00.

Dana's MINERALS AND HOW TO STUDY THEM, $1.20; postpaid, $1.30.

THE EXCELSIOR COLLECTION.

The Excelsior collection consists of two hundred specimens of the most important mineral species and a few characteristic and necessary varieties. The specimens are of large size, crystallized where possible, and attractive in appearance.

The *elements* are represented by two non-metals and three native metals. The *sulphides*, which include most of the important rich ores, are covered by fifteen typical specimens, while three specimens illustrate the small but interesting group of *haloids*.

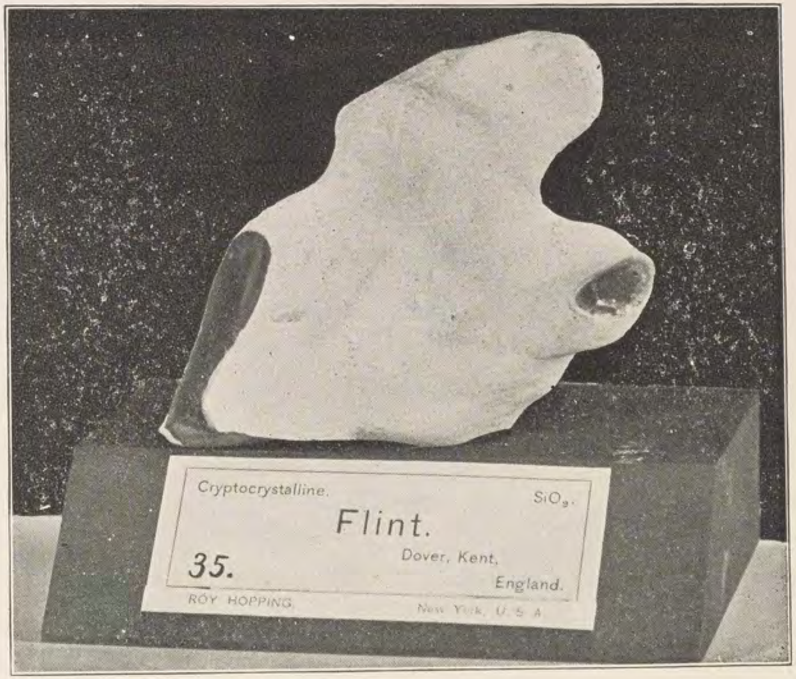
The next division is the important *oxides* the non-metallic oxides being quartz and opal with their varieties, the metallic including ores of the common and uncommon metals such as copper, zinc, iron, tin, aluminum, titanium, etc. Forty-three specimens are necessary for thorough illustration.

The *carbonates*, including calc spar, spathic iron, etc., contain many common but showy species of which twenty-one specimens are given.

The most numerous division of mineralogy is that of the *silicates* headed by the feldspars; orthoclase, albite, microcline, etc., and containing pyroxene, amphibole (hornblende, asbestus, etc.,) beryl, garnet, olivine, topaz, tourmaline and other important species. The seven best known zeolites and nine micas represent these groups after which come serpentine, talc, kaolin, chryscolla, etc. Fourteen *phosphates*, nine *sulphates*, and four *hydrocarbons*, with three specimens for the small intermediate group round out the collection, leaving no section unrepresented.

In order that a comprehensive idea may be obtained of the manner in which the Excelsior collection illustrates the science of mineralogy, a classified list is given with the chemical name for facilitating comparisons.

EXCELSIOR COLLECTION.



FLINT NODULE, ENGLAND.

MOUNTING.

The two hundred specimens composing the Excelsior collection are each mounted on a wooden block with a beveled front to receive the label. The latter is printed in neat gothic, black on white paper, and contains the system of crystallization and chemical formula above, with the name in the centre and locality below it. The left hand corner has the number in red ink, corresponding to the number on the specimen. The whole when mounted presents a very attractive appearance, and is best displayed in a glass front wall case of about 80 linear feet of shelving in any suitable arrangement.

PURPOSE.

This collection is for the use of high schools and colleges and is suitable for reference during a course of study from any standard text book. The arrangement is according to Dana's SYSTEM OF MINERALOGY.

200 specimens, numbered, mounted on wooden blocks with printed labels, packed ready for shipment, $100.00.

Dana's SYSTEM OF MINERALOGY, (list, $12.00,) extra, $10.00.

EXCELSIOR COLLECTION.

1. Graphite or "Black Lead," carbon, Warren Co., N. Y.
2. Sulphur, native, near Girgenti, Sicily, Italy.
3. Gold, native, Black Hills, S. Dakota.
4. Silver, native, Broken Hill, N. S. W., Australia.
5. Copper, native, Keweenaw Point, Mich.
6. Orpiment and realgar, arsenic sulphides, Banat, Hungary.
7. Stibnite or Antimony Glance, antimony sulphide, Warren Co., N. Y.
8. Molybdenite or Molybdenum Glance, molybdenum sulphide, Altenberg, Saxony.
9. Argentite or Silver Glance, silver sulphide, Batopilas, Mexico.
10. Galenite or Lead Glance, lead sulphide, Southampton, Mass.
11. Chalcocite or Copper Glance, Butte, Mont.
12. Sphalerite or Zinc Blende, zinc sulphide, Joplin, Mo.
13. Millerite, nickel sulphide, Gap Mines, Lancaster Co., Pa.
14. Niccolite, nickel arsenide, Richelsdorf, Hessen, Germany.

15. Pyrrhotite or Magnetic Pyrites, iron sulphide, Gap Mines, Lancaster Co., Pa.
16. Bornite or Peacock Copper Ore, copper iron sulphide, Granville Co., N. C.
17. Chalcopyrite or Copper Pyrites, copper iron sulphide, Rowe, Mass.
18. Pyrite or Iron Pyrites, iron sulphide, Sayreville, N. J.
19. Marcasite or Coxcomb Pyrites, iron sulphide, Joplin, Mo.
20. Arsenopyrite or Arsenic Pyrites, arsenic iron sulphide, Freiberg, Saxony.
21. Halite or Rock Salt, native, sodium chloride, Ellsworth Co., Kansas.
22. Fluorite or Fluor Spar, calcium fluoride, Macomb, N. Y.
23. Cryolite or Icestone, aluminium sodium fluoride, Ivigtut, Arksuk Fiord, Greenland.
24. Quartz, crystal, silicon oxide, Suttrop, Germany.
25. Rock Crystal, near Hot Springs, Ark.
26. Amethyst, Paterson, N. J.
27. Rose Quartz, Bowdoin, Maine.
28. Smoky Quartz, Pikes Peak, Col.
29. Milky Quartz, Berks Co., Penn.
30. Chalcedony, Berks Co., Penn.
31. Carnelian, red chalcedony, Brazil.
32. Bloodstone or Heliotrope, polished, India.
33. Agate, polished, Brazil.
34. Moss Agate, polished, India.
35. Flint, black, Dover Chalk Cliffs, England.
36. Basanite or Touchstone, Langenstriegis, Saxony.
37. Jasper, yellow, Berks Co., Penn.
38. Wood Agate, silicified wood, Petrified Forest near Holbrook, Ariz.
39. Opal, precious, hydrous silicon oxide, Queretero, Mexico.
40. Wax Opal, Veresvagas, Hungary.
41. Hyalite, Kamloops Lake, British Columbia.
42. Tripolite, opal earth, Nevada.

OXIDES OF METALS.

43. Cuprite, red copper oxide, Copper Queen Mine, Bisbee, Ariz.
44. Zincite, red zinc oxide, Franklin Furnace, N. J.

45. Corundum, aluminium oxide, Laurel Creek, Ga.
46. Ruby, Burma.
47. Emery, Chester, Mass.
48. Hematite, iron sesquioxide, Cumberland, England.
49. Kidney Ore, Cumberland, England.
50. Red Ocher, Clinton, N. Y.
51. Spinel, magnesium aluminate, Ottawa Co., Quebec, Canada.
52. Spinel Ruby, Ceylon.
53. Magnetite or Magnetic Iron Ore, iron oxide, Essex Co., N. Y.
54. Lodestone or Natural Magnet, Magnet Cove, Ark.
55. Franklinite, zinc iron manganese oxide, Franklin Furnace, N. J.
56. Chromite or Chromic Iron, iron chromium oxide, Sherbrooke, Quebec, Canada.
57. Cassiterite or Tinstone, tin oxide, Geyer, Saxony.
58. Stream Tin, aluvial, Durango, Mexico.
59. Rutile, titanium oxide, Magnet Cove, Ark.
60. Brookite, titanium oxide, Magnet Cove, Ark.
61. Pyrolusite, black manganese oxide, Ilmenau, Thuringia, Germany.
62. Diaspore, hydrous aluminium oxide, Chester, Mass.
63. Limonite or Brown Iron Ore, hydrous iron oxide, Edge Hill, Penn
64. Bauxite, pisolitic hydrous aluminium oxide, Bartow Co., Ga.
65. Brucite, magnesium hydrate, Hoboken, N. J.
66. Psilomelane, hydrous manganese manganate, Rossbach, Germany.

CARBONATES.

67. Calcite or Calc Spar, rhombohedral cleavage, Joplin, Mo.
68. Nailhead Spar, low rhombohedral crystals, Lawrence Co., S. Dakota.
69. Dog Tooth Spar, scalenohedral, Joplin, Mo.
70. Mexican Onyx Marble, California Peninsula.
71. Chalk, earthy, Dover Cliffs, England.
72. Pisolite or Peastone, Karlsbad, Bohemia.
73. Calcite Stalactite, Copper Queen Mine, Bisbee, Ariz.
74. Calc Tufa or Petrified Moss, Montgomery Co., Ind.
75. Dolomite, or Pearl Spar, calcium magnesium carbonate, Niagara Falls, N. Y.
76. Teruelite, black crystals, Teruel, Spain.
77. Magnesite, magnesium carbonate, Greece.
78. Siderite or Spathic Iron, iron carbonate, Roxbury, Conn.

79. Rhodochrosite, manganese carbonate, Kapnik, Hungary.
80. Smithsonite, zinc carbonate, Rhineland, Germany.
81. Aragonite, crystal, calcium carbonate, Horenc, near Bilin, Bohemia.
82. Flos Ferri, coralloidal, Eisenerz Styria, Austria.
83. Satinstone, silky, Eisenerz Styria, Austria.
84. Strontianite, strontium carbonate, Hamm, Germany.
84. Cerussite, lead carbonate, Las Cruces, N. M.
85. Malachite, green copper carbonate, Copper Queen Mine, Bisbee, Ariz.
86. Azurite, blue copper carbonate, Copper Queen Mine, Bisbee, Ariz.

SILICATES.

THE FELDSPARS.

87. Orthoclase or Common Feldspar, cleavage, potassium aluminium silicate, Delaware Co., Pa.
88. Twin Crystals, Karlsbad, Bohemia.
89. Adularia, twinned, St. Gothard, Switzerland.
90. Amazonite or Green Microcline, Pikes Peak, Colorado.
91. Albite or Soda Feldspar, sodium aluminium silicate, Macomb, N. Y.
92. Clevelandite, pearl white, Chesterfield, Mass.
93. Oligoclase, cleavable, sodium calcium aluminium silicate, New York City.
94. Sunstone, aventurine, Twedestrand, Christiania Fiord, Norway.
95. Labradorite or Labrador Spar, drab, Labrador.
96. Anorthite, twin crystal, calcium aluminium silicate, Miyakojima, Japan.

THE PYROXENES.

97. Enstatite, Bronzite, ferruginous magnesium silicate, Texas, Pa.
98. Hypersthene, iron magnesium silicate, Berks Co., Pa.
99. Diopside, Pyroxene, calcium magnesium silicate, Macomb, N. Y.
100. Augite, crystals, iron pyroxene, Bilin, Bohemia.
101. Jeffersonite, zinc manganese pyroxene, Franklin Furnace, N. J.
102. Aegirite, sodium iron silicate, Hot Springs, Arkansas.

03. Spodumene, lithium aluminium silicate, Bolton, Mass.
104. Wollastonite, calcium silicate, Lewis Co., N. Y.
105. Pectolite, hydrous sodium calcium silicate.
106. Rhodonite, Fowlerite, manganese silicate, Franklin Furnace, N. J.

THE AMPHIBOLES.

107. Tremolite, calcium magnesium silicate, Edwards, N. Y.
108. Actinolite, iron amphibole, Huntington, Mass.
109. Asbestus, fibrous actinolite, Middlesex Co., N. J.
110. Hornblende, black amphibole, Eganville, Ontario, Canada.
111. Beryl, beryllium silicate, Ackworth, N. H.
112. Iolite or Dichroite, Sandokedal, Norway.
113. Cancrinite, in elaeolite syenyte, Litchfield, Maine.
114. Sodalite, sodium aluminium silicate, Litchfield, Maine.

THE GARNETS.

115. Grossularite, Rosolite, pink garnet, Xalostoc, Morelos, Mexico.
116. Pyrope, Precious Garnet, Navajo Reservation, N. M.
117. Almandite in gneiss, Huntington, Mass.
118. Andradite or Common Garnet, Phippsburg, Maine.
119. Schorlomite, Magnet Cove, Arkansas.
120. Chrysolite or Olivine, magnesium iron silicate, Webster, N. C.
121. Willemite, zinc silicate, Franklin Furnace, N. J.
122. Wernerite or Common Scapolite, lilac, Bolton, Mass.
123. Vesuvianite or Idocrase, Sandford, Maine.
124. Zircon, zirconium silicate, El Paso Co., Colo.
125. Danburite, calcium boron silicate, Russell, N. Y.
126. Topaz, fluo-aluminium silicate, near Simpson, Utah.
127. Andalusite, aluminium silicate, Bulle, Switzerland.
128. Chiastolite, polished section, Lancaster, Mass.
129. Sillimanite or Fibrolite, aluminium silicate, Chester, Conn.
130. Kyanite, aluminium silicate, Litchfield Co., Conn.
131. Datolite, calcium boron silicate, Bergen Hill, N. J.
132. Zoisite, gray, hydrous calcium aluminium silicate, Huntington. Mass.
133. Thulite, pink, Mitchell Co., N. C.
134. Epidote, Untersulzbachthal, Tyrol, Austria.
135. Allanite, Amherst Co., Virginia.
136. Prehnite, hydrous calcium aluminium silicate, Paterson, N. J.
137. Chondrodite, Edenville, N. Y.

138. Calamine, hydrous zinc silicate, Friedensville, Penn.
139. Tourmaline, black, Pierrepont, N. Y.
140. Rubellite, pink tourmaline, Paris, Maine.
141. Staurolite in chlorite schist, Grafton Co., N. H.

THE ZEOLITES.

142. Apohhyllite, hydrous potassium calcium silicate, Paterson, N. J.
143. Heulandite, hydrous calcium aluminium silicate, Paterson, N. J.
144. Stilbite, hydrous calcium aluminium silicate, Paterson, N. J.
145. Laumontite, hydrous calcium aluminium silicate, Paterson, N. J.
146. Chabazite, hydrous calcium sodium aluminium silicate, Nova Scotia.
147. Analcite, hydrous sodium aluminium silicate, Frombach, Tyrol, Austria.
148. Natrolite, hydrous sodium aluminium silicate, Guttenberg, N. J.

THE MICAS.

149. Muscovite or Common Mica, hydrous potassium aluminium silicate, Harlem, New York City.
150. Magnetited Muscovite or Picture Mica, Delaware Co., Penn.
151. Lepidolite or Lithium Mica, Paris, Maine.
152. Zinnwaldite or Lithium Iron Mica, Zinnwald, Saxony.
153. Biotite or Black Mica, Burgess, Canada.
154. Phlogopite or Brown Mica, Burgess, Canada.
155. Margarite or Pearl Mica, Chester, Mass.
156. Seybertile or Bronze Mica, Amity, N. Y.
157. Clinochlore or Chlorite Mica, Chester Co., Pa.
158. Chalcodite, Sterling Iron Mine, Antwerp, N. Y.

THE SERPENTINES.

159. Serpentine, hydrous magnesium silicate, Hoboken, N. J.
160. Chrysotile or Fibrous Serpentine, Passaic Co., N. J.
161. Garnierite, hydrous nickel silicate, Noumea, New Caledonia.
162. Talc, hydrous magnesium silicate, near Marietta, Ga.
163. Soapstone or Steatite, Cherokee Co., N. C.
164. Sepiolite or Meerschaum, hydrous magnesium silicate, Eski Sher, Asia Minor, Turkey.
165. Kaolinite, hydrous aluminium silicate, near New Brunswick, N. J.
166. Thaumasite, hydrous calcium silicate, carbonate and sulphate, Paterson, N. J.

167. Chrysocolla, hydrous copper silicate, Globe, Ariz.
168. Titanite, calcium titanium silicate, Eganville, Canada.
169. Astrophyllite, iron titanium silicate, El Paso Co., Colo.

NIOBATES.

170. Columbite, iron niobate, Bob Ingersoll Mine, Pennington Co., S. Dakota.
171. Samarskite, niobo-tantalate of the rare metals, Mitchell Co., N. C.

PHOSPHATES, ETC.

172. Xenotime, yttrium phosphate, Harlem, New York City.
173. Monazite, sand, phosphate of the rare metals, McDowell Co., N. C.
174. Triphyllite, lithium phosphate, Huehnerkobl, Bavaria.
175. Apatite, calcium phosphate, Ontario, Canada.
176. Pyromorphite, lead phosphate, Ems, Nassau, Germany.
177. Vanadinite, lead vanadate, Mammoth, Ariz.
178. Amblygonite, lithium aluminium fluo-phosphate, Montebras, France.
179. Olivenite, hydrous copper arsenate, Eureka, Utah.
180. Vivianite, hydrous iron phosphate, Mullica Hill, N. J.
181. Variscite, hydrous aluminium phosphate, Montgomery Co., Ark
182. Wavellite, hydrous aluminium phosphate, Montgomery Co., Ark.
183. Turquois, hydrous aluminium phosphate, Los Cerrilos, N. M.
184. Ekdemite, lead arsenate, Mammoth, Ariz.
185. Soda Niter, sodium nitrate, Tarapaca, Chili.

SULPHATES.

186. Barite, barium sulphate, Hampshire Co., Mass.
187. Celestite, strontium sulphate, Lansdowne, Canada.
188. Anhydrite, calcium sulphate, Avon River, Nova Scotia.
189. Gypsum, hydrous calcium sulphate, Grand Rapids, Mich.
190. Selenite, cleavage, near Girgenti, Sicily, Italy.
191. Satin Spar, Derbyshire, England.
192. Alabaster, Niagara Falls, N. Y.

193. Aluminite, hydrous aluminium sulphate, Halle-on-Saale, Germany.

194. Alunite, hydrous potassium aluminium sulphate, Muszay, Hungary.

TUNGSTATES, MOLYBDATES.

195. Wolframite, iron manganese wolframate, Zinnwald, Saxony.

196. Scheelite, calcium wolframate, Zinnwald, Saxony.

196. Wulfenite, lead molybdate, Los Cerillos, N. M.

HYDROCARBONS.

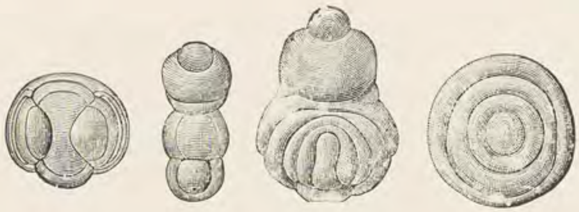
197. Ozokerite or Native Paraffin, Boryslaw, Galicia.

198. Asphaltum, Island of Trinidad.

199. Cannel Coal, Grayson, Ky.

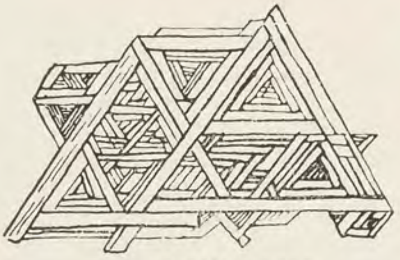
200. Lignite or Wood Coal, Sayreville, N. J.

PLATE IX.

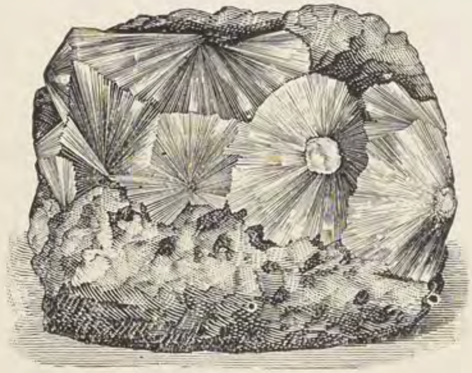


CONCRETIONS FROM CLAY BEDS.

CALCITE STALACTITE.



RETICULATED RUTILE.



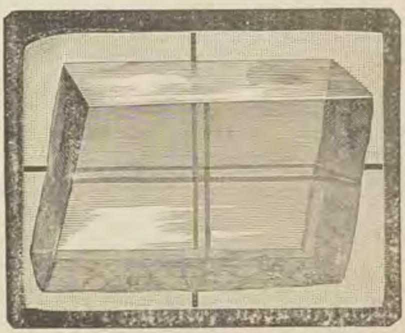
RADIATED PECTOLITE.

STRUCTURE AND FORM,

PHYSICAL PROPERTIES.


CONCHOIDAL FRACTURE, OBSIDIAN.

Estimates will be given on sets to represent the physical properties of minerals. They are furnished in three sizes 1x1½ inches in box with trays and list, 1½x2 inches with printed labels and 2x3 inches, mounted on blocks with beveled front on which is the label. The *cleavage* set contains six specimens as does also the sets illustrating *fracture*, *specific gravity*, *fusibility* and *taste and odor*. *Luster*, *streak* and the *scale of hardness* have each nine specimens. The diamond, No. 10, in the scale of hardness is furnished mounted in a brass pencil for $1.00 extra when desired. *Color*, metallic and unmetallic, from whence many minerals are named, is covered by twenty-five specimens. Five specimens represent the grades from *transparent* to *opaque* and nine specimens the peculiar optical properties such as *play of colors*, *chatoyancy*, *dichroism*, *phosphorescence*, *double refraction*, *etc.* Twenty-five specimens, carefully selected, represent *structure and form*, which is, perhaps, the most important of the series. Magnetism and magnetic polarity, illustrated by magnetite and its variety lodestone, may be had separately, for which see price list.


DOUBLE REFRACTION—ICELAND SPAR.


MAGNETIC POLARITY—LODESTONE.

CRYSTALLOGRAPHY.

DOLOMITE, TERUIL.

IRON CROSS TWIN.

COLLECTION OF CRYSTALS

TO ILLUSTRATE THE FUNDAMENTAL FORMS AND COMBINATIONS.

I. ISOMETRIC OR CUBIC SYSTEM.

1. Octahedron.
2. Trapezohedron.
3. Rhombic dodecahedron.
4. Cube.
5. Cubo-octahedron.
6. Pentagonal dodecahedron.

II. TETRAGONAL SYSTEM.

7. Tetragonal octahedron.
8. Square prism and base.

III. HEXAGONAL SYSTEM.

9. Hexagonal prism.
10. Rhombohedron.
11. Rhombohedrons and prism.
12. Scalenohedron.

IV. ORTHORHOMBIC SYSTEM.

13. Orthorhombic prism.
14. Orthorhombio octahedron.

V. MONOCLINIC SYSTEM.

15. Prism and base.
16. Prism and pyramid.
17. Base, prism and pyramid.

VI. TRICLINIC SYSTEM.

18. Prism, base and pyramid.

TWINNING.

19. Cubic penetration twin, fluorite.
20. Iron cross penetration twin, pyrite.
21. Cruciform twin, staurolite.
22. Karlsbad twin, orthoclase.
23. Sixling twin, pseudohexagonal,
24. Contact twin, hornblende aragonite.

PSEUDOMORPHISM.

25. Limonite after Pyrite.

25 crystals in trays and box, numbered and with list, $2.50.

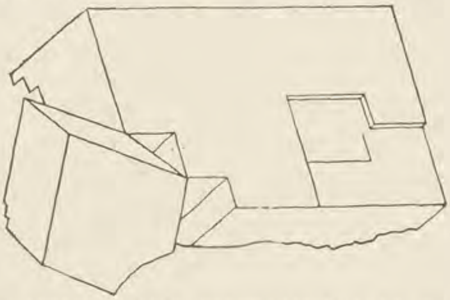
25 crystals mounted on blocks with labels, numbered, $5.00.

LOOSE CRYSTALS.

We devote an entire case of twenty-four large shallow drawers to loose crystals, complete and perfect or detached. Since the increased demand for crystals for study in the universities and also by the private collector, we have made loose crystals a specialty. In order to convey some idea of stock on hand at present, we state that we have over 2000 crystals of Selenite from Ohio, 1000 Topaz from Utah, 1000 Pyrite from Brazil, 1000 Dolomite (Teruelite) from Spain, 1000 Garnet from S. Dak., 1000 Quartz from Germany, 1000 Smoky Quartz from Colorado, 500 Quartz, slim, from Arkansas, 700 Amazonite from Colorado, 500 Aragonite from Bohemia, 500 Augite from Bohemia, 200 Titanite from Canada, 200 Magnetite from N. Y., 200 Hornblende from Bohemia, 100 Zircon from N. Y., 100 Apatite from Canada, and smaller numbers of many others. Also 300 polished Chiastolite cross sections showing the regular arrangement of included impurities and the variable pattern of the colored figure.

We therefore believe we can claim to be *headquarters for loose crystals* and can furnish them singly or in quantity at lower prices than elsewhere. From such quantities of crystals it is of course, possible to select many fine large perfect specimens, rare forms and twins of various kinds. Special bulletin CRYSTALS sent on application.

PSEUDOMORPH CRYSTALS.



LIMONITE AFTER SIDERITE, NORTH CAROLINA; DR. F. A. GENTH.

Four molecules of siderite by the loss of carbon dioxide or carbonic acid gas and assumption of oxygen leave two molecules of hematite, which, by assuming three molecules of water become the hydrous iron oxide, limonite. These pseudomorphs occur in clay with a hematite base.

SIDERITE.	HEMATITE.	LIMONITE.
$4(FeO.CO_2)-4(CO_2)+2O$	$2Fe_2O_3+3H_2O=$	$2Fe_2O_3.3H_2O$

"Every true mineral species has, when crystallized, a form peculiar to itself; occasionally, however, crystals are found that have the form, both as to angles and general habit, of a certain species, and yet differ from it entirely in chemical composition. Moreover it is often seen that, though in outward form complete crystals, in internal structure they are granular or waxy, and have no regular cleavage.

Such crystals are called *pseudomorphs*, and their existence is explained by the assumption, often admitting of direct proof, that the original mineral has been changed into the new compound, or has disappeared through some agency, and its place been taken by another chemical compound to which the form does not belong.

Pseudomorphs have been classed under several heads.

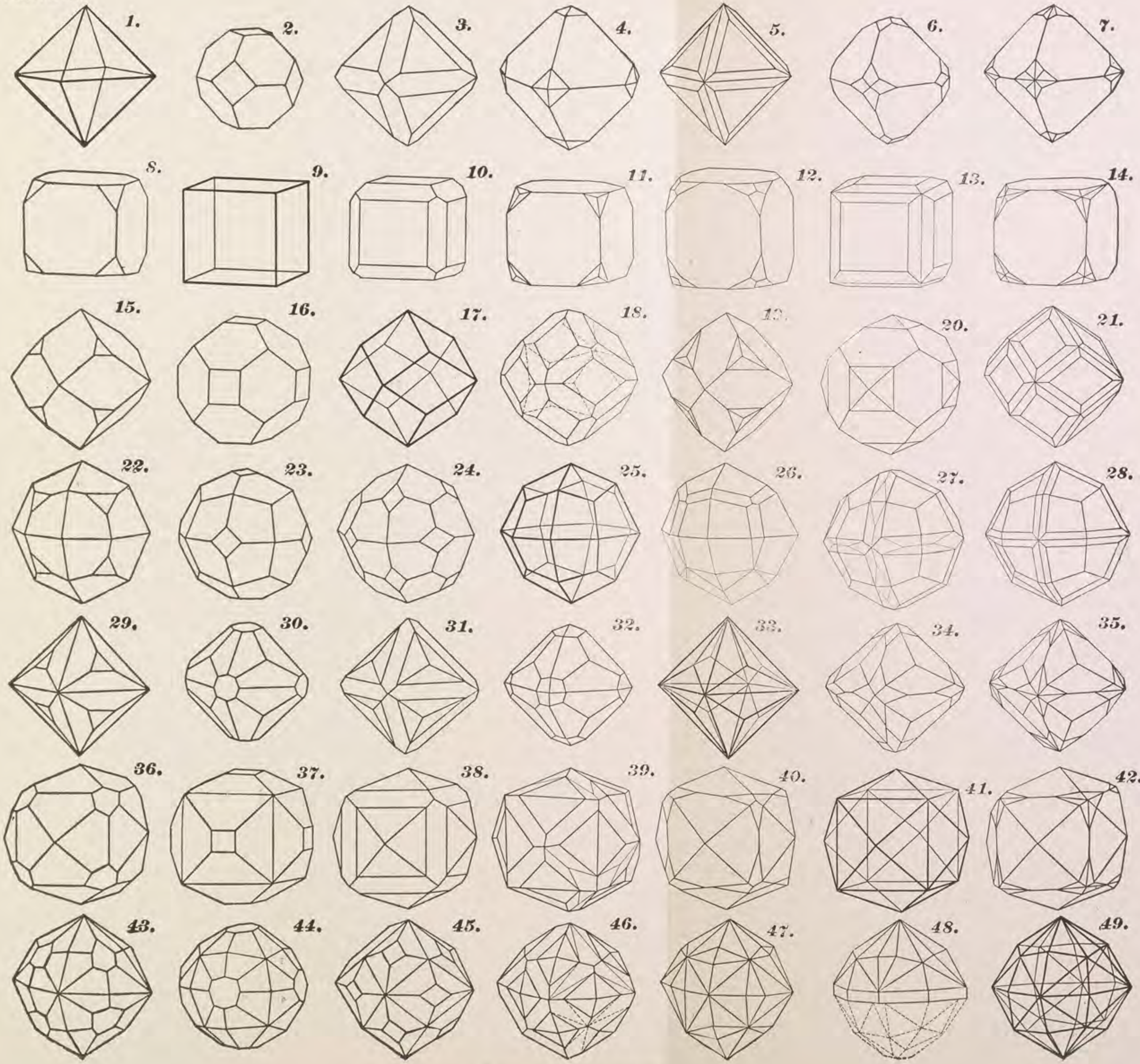
1. Pseudomorphs by *substitution*. 2. Psendomorphs by *deposition*.
3. Pseudomorphs by *alteration*."—E. S. Dana.

A pseudomorph by alteration in *from* without an alteration in *composition* is called a *paramorph*.

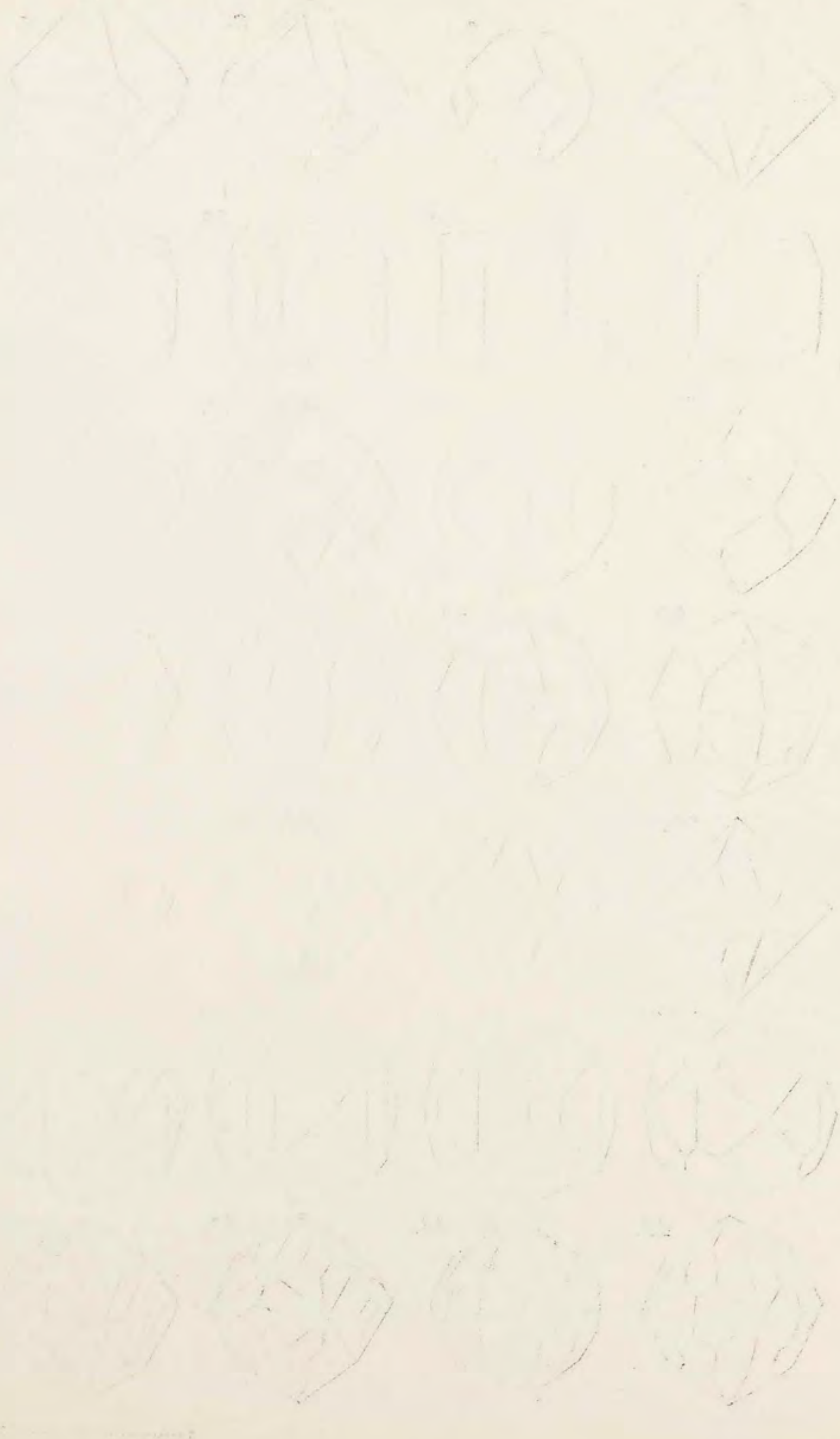
PSEUDOMORPHS.

Calcite after Celestite, Obersdorf, Germany, "barleycorn crystals,"	25c.-35c.
Chlorite after Staurolite, Claremont, N.H., simple prisms,	10c.-25c.
Limonite after Pyrite, East Whiteland, Pa., cubes with pyrite kernel,	10c.-35c.
Limonite after Siderite, Catawba Co., N. C., rhombohedrons,	35c.-75c.

PLATE X.

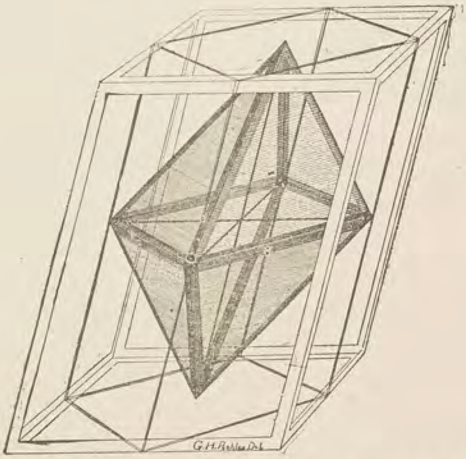


ISOMETRIC COMBINATIONS.



Malachite after Cuprite, Chessy, France, "green cuprite" dodecahedrons, etc.,	25c.–35c.
Pinite after Iolite, Auvergne, France, six and eight sided prisms,	15c.–25c.
Quartz after Crokidolite, Tiger Eye, Griqualand-West, Africa, fibriform,	10c.–25c.
Quartz after Oolite, Silicified Oolite, Center Co., Pa., oolitic,	10c.–25c.
Quartz after Wood, Agatized Wood, Arizona, mottled,	10c.–25c.
Rutile after Brookite, Magnet Cove, Ark., paramorph,	25c.–75c.

CRYSTAL MODELS.



CELLULOID CRYSTAL MODELS.

These models are especially suitable for class work. They are made from transparent sheet celluloid, joined at the edges with silk gauze. Each model represents three forms, the first being of colorless celluloid, the second marked in blue, and the third of red celluloid within. The axes are represented by colored silk of one color in the isometric system, two colors in the tetragonal and hexagonal, and three colors in the remaining three systems. They stand four-inches high and may be handled without fear of breakage from dropping They are unequalled for the purpose of class lectures.

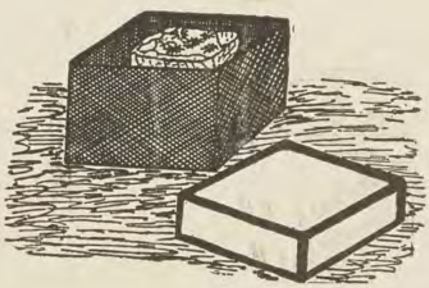
6 models, size four inches, set in baize-covered partition, leatheret finished box, $16.00.

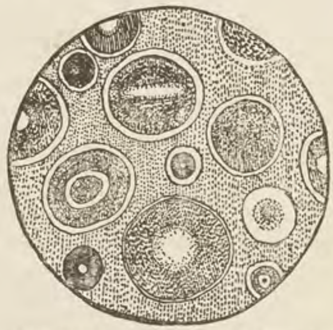
PEAR WOOD MODELS.

These models are scientificly made from fine grained wood and average 2 inches.

108 models, pivot twins, etc., in large flat wooden box with list, $24.00.

BOX MOUNTS.





SILICIFIED OOLITE, MAGNIFIED.

Small groups, chips, polished specimens and "sand" crystals mounted in standard one inch boxes, for use with the microscope, are sent by mail on approval for selection. The mounting box is light and neat, finished in fast black, with a glazed white cover, trimmed with red. The cover measures exactly one inch square. The beauty and variety of the color and form of microscopic crystals is superior to the majority of larger specimens.

The price on all mounts without exception is 25c. each, and a dozen from which to select will be sent on receipt of $1.00.

Standard boxes, best quality, 3c., each, $2.00 per doz.

Silicified oolite, polished agate, Venetian aventurine glass, magnetited mica, and pyrite, calcite, and quartz crystal "sand," etc., etc., unmounted, 10c., per mount.

SMALL PYRITE CRYSTALS.

BY JOHN A. MANLEY.

Not long ago, in washing the clay from some of the pyrite which was obtained at the clay pits near Sayersville, N. J., the writer found that the pan in which the specimens had been washed contained some very fine grit. After careful and repeated washings this grit proved to be very small crystals of fine bright pyrite. They were allowed to settle and then carefully dried, and proved to be beautifully sharp crystals, some plain cubes, others in groups of three or more, some showing octahedral faces, and in a few the octahedral faces showed the peculiar built-up or stepped faces, which is so well shown in the large specimens from that locality.

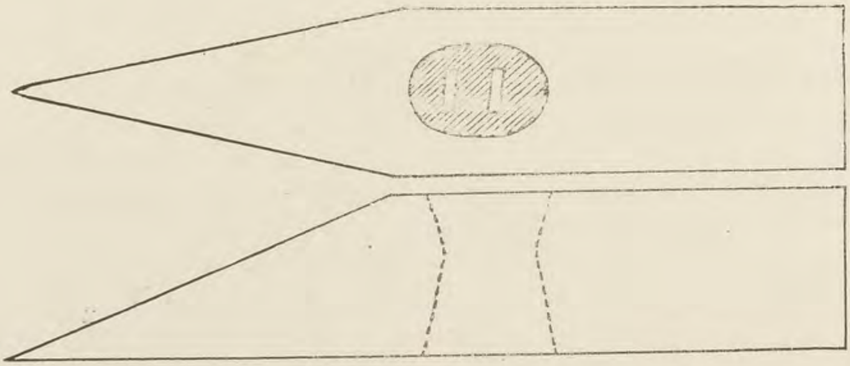
They range in size from 1-100 to 1-250 of an inch on the faces, the larger proportion being about 1-150 of an inch ; some of the smaller ones show curious pittings or etchings on the faces, arranged nearly in straight rows across the face, much like the striations sometimes seen on pyrite, except that they seem to consist of a row of dots rather than a continuous line. Allowing the average at 1-200 of an inch in size it would take about 8,000,000 of these crystals to make a pile of 1 cubic inch.—*The Mineral Collector.*

ACCESSORIES.

CRYSTAL HOLDERS.

1. BLACK WOOD STAND, deep cup, laquer finish, 3c., each, 30c., per doz.
2. BOTTLE CAP STAND, as above, with cork and removable glass cap, 5c., each, 50c., per doz.
3. BLACK WOOD BASE, black or white caps, 2c., each, 20c., per doz.
4. BOTTLE CAP BASE, as above, with cork and removable vial, 5c., each, 50c., per doz.
5. TUBULAR HOLDER, a 2½ inch vial, horizontally supported by a brass standard on a black wood base, 5c., each, 50c., per doz.
6. PIGMIE HOLDER, a 1½ inch vial, same as above, 5c., each, 50c., per doz.
7. PERPECT HOLDER, and gem clip, with tack point or on a black wood base, 5c., each, 50c., per doz.

HAMMERS.



Two styles, A, chisel edge parallel to handle, B, perpendicular to handle.

The best percussion tempered steel head, one square end and one chisel edge, (either parallel or at right angles to the handle.)

7 oz. head, style a, hard wood handle, trimming hammer,		.75
12 oz. head, style a or b, hard wood handle, work room hammer,		$1.00
20 oz. head, style b, hard wood handle, field hammer,		1.25

LABELS.

Rhombohedral. SiO_2

Rock Crystal, silica, silicon dioxide.

Quartz,

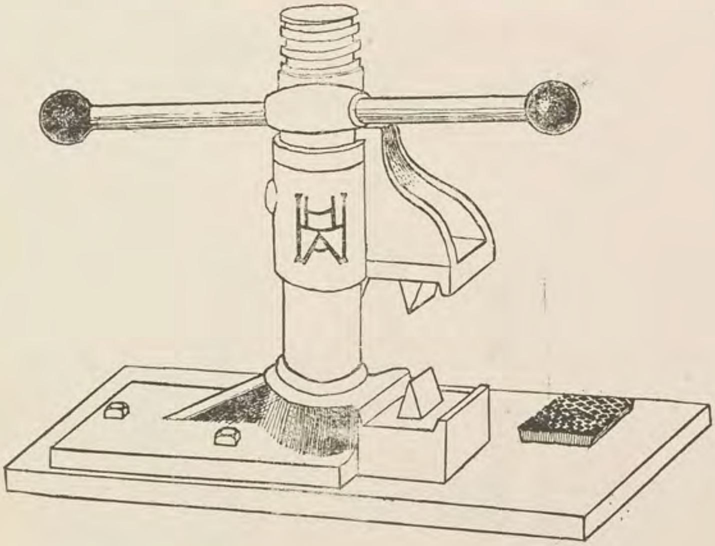
Near Hot Springs,

Arkansas.

ROY HOPPING, New York, U. S. A.

Printed on heavy paper in neat gothic, locality blank and also important localities, any species or variety. Assorted per 100, $1.00

THE HANDY ANDY TRIMMER.



Size of base $4\frac{1}{2}$ x 11 inches, height 12 inches, greatest distance between chisels $5\frac{1}{2}$ inches, length of lever 24 inches, weight 45 lbs. Price complete with diamond plate, $15.00

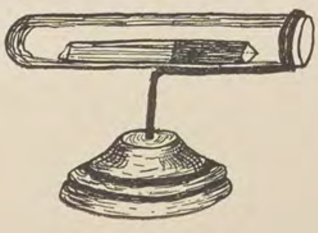
CRYSTAL HOLDERS.

1

2

3

4



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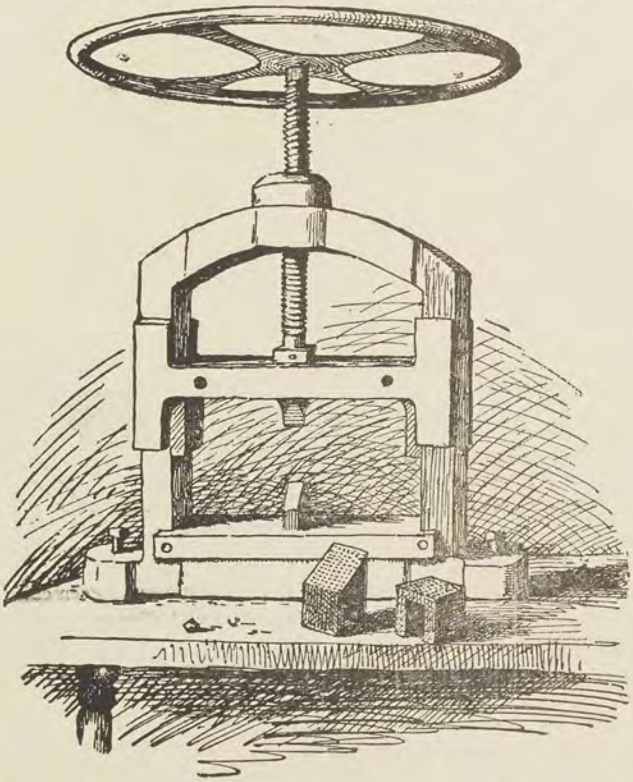
7

IMPROVED MINERAL TRIMMER.



Size of base 4x20 inches, height 28 inches, greatest distance between chisels 5 inches, diameter of wheel 26 inches, weight 100 lbs.

Price complete with rasp-topped tables, $35.00.

PRICE LIST.

The number preceding each name is the species number of Dana's System of Mineralogy.

		$1\frac{1}{2}$x2	2x3
563.	Adamite, Laurion, Greece, crystals on limonite	$1.00	$1.25
313.	Adularia, Switzerland, twinned crystal groups	.50	1.00
326.	Aegirite, Magnet Cove, Arkansas, slim black crystals, penetrating a white rock	.25	.75
210.	Agate-Brazil, polished, variegated	.35	.75
	Moss Agate, India, polished green	.25	.75
210.	Agate-Jasper, Honduras, striped, brecciated	.10	.25
63.	Alabandite, Nagyag, Hungary	.50	
746.	Alabaster, massive white or tinted	.10	.20
327.	Albite, massive white soda feldspar	.10	.20
	Pericline, Swiss Alps, groups	.35	.75
	Clevelandite, Chesterfield, Mass., lamellar	.15	.25
409.	Allanite, massive black	.10	.20
370.	Almandite garnets, in mica schist	.15	.25
	Loose crystals 5c.—25c.		
791.	Aluminite, Halle-on-Saale, Germany, complete concretions, white	.50	
	Smaller complete concretions 20c.—35c.		
800.	Alunite, Muszay, Hungary, drusy cavernous, pinkish white alumstone	.20	.35
315.	Amazonite, amazonstone, Amelia, Va., cleavable green microcline	.15	.35
	Single large crystals or groups, Colorado, blue green	.35	.75
	Amber or Succinite Baltic Coast, Germany, fossil gum	.35	.75

	$1\frac{1}{2}$x2	2x3
559. Amblygonite, Hebronite, Hebron, Me., cleavable, white	.25	.50
Montebrasite, Montebras, France; pale purple cleavages	.35	.50
210. Amethyst, Paterson, N. J., groups on trap rock	.20	.35
Phantom crystals in groups, Hungary	.50	.75
Large single crystals, N. Carolina, 15c.—35c., $1\frac{1}{2}$x2—2x$2\frac{1}{2}$		
338. Amphibole,		
Actinolite, Zillerthal, Tyrol, Austria, long crystals in talc, green-black	.25	.50
Massive fibriform, radiated, green, Mass.	.10	.20
Edenite, Edenville, N. Y., greenish gray crystals	.20	.35
Hexangonite, Edwards, N. Y., purple matted tremolite	.20	.35
Hornblende, Eganville, Ontario, Canada, black, cleavable	.10	.25
Groups of black stout crystals	.25	.50
Loose single crystals 10—35c.		
Mountain Cork, Buckingham, Canada, white pithy (floats)	25.	.50
Smaragdite, Clay Co., N. C., compact green	.20	.35
Tremolite, grayish to tendon white, columnar	.20	.35
450. Analcite, crystal groups	.35	.75
398. Andalusite, crystals in the rock	.25	.50
Chiastolite, Lancaster, Mass., crystal (sections polished) in mica schist	.25	.50
Sections of free crystals polished, $\frac{1}{2}$ to 1 inch across, 10c.—25c.		
Long (uncut) crystals, natural, 25c.		
721. Anglesite, crystallized	.75	1.00
722. Anhydrite, Bleiberg, Carinthia, Austria, massive transluscent blue	.35	.75
Berechtesgaden, Bavaria, square prisms, cleavable, pellucid	.25	.50
320. Anorthite, Miyakajuna, Japan, $\frac{3}{4}$ inch twinned crystals, 25c.		

	2½x2	2x3
10. Antimony, York County, N. B., native metallic crystalline	1.50	2.50
549. Apatite, Eganville, Canada, large brown hexagonal crystals	.25	.50
Smaller crystals 10c.—20c.		
435. Apophyllite, Paterson, N. J., crystals on drusy quartz and trap	.20	.35
277. Aragonite, crystal groups	.15	.25
Frizington, England, groups, acicular ("cathedral spires")	.25	.50
Flos Ferri, Eisenerz, Styria, snow-white, coralloidal	.35	.75
Fountainstone, Karlsbad, Bohemia, light brown, banded	.20	.35
Satinstone, Eisenerz, Styria, satin-white	.15	.25
Loose crystals, Horenc, near Bilin, Bohemia, pale transparent yellow 10c.—50c., Oscillated twins, 20c.—75c., Doublets and trillings, geniculated, 25—75c.		
Complete psendohexagonal sixling twin crystals, Molina, Aragon. Spain 10c.—25c. Larger, stout, Bastennes, France, 15c.—50c.		
42. Argentite, sectile silver glance	.35	.75
253. Arkansite, Brookite, Magnet Cove, Arkansas	.35	.75
8. Arsenic, Akadani, Japan, spheres, crystallized 25c.—75c.		
98. Arsenopyrite, Freiberg, Saxony	.15	.35
338. Asbestus, fibrous amphibole	.25	.50
Asphaltum, Island of Trinidad	.10	.20
514. Astrophyllite, El Paso Co., Col., bladed bronze crystals in the rock	.20	.50
325. Augite, Bilin, Bohemia, complete black crystals 10c.—35c.		
290. Aurichalcite, Hungary	1.00	
410. Axinite, Switzerland; Tyrol, Austria, groups	.75	
289. Azurite, Bisbee, Arizona, azure blue groups	.35	.75
719. Barite, Cumberland, England; Hungary, S. Dakota, groups	.35	.75

		1½x2	2x3
	Massive white, Hampshire Co., Mass.	.10	.20
	Stinkstone or Fetid Barite, black crystaline, fetid odor when rubbed	.10	.25
210.	Basanite, Langenstriegis, Germany, black jaspery quartz	.20	.50
261.	Bauxite, Bartow Co., Ga.. large pisolitic, red or yellowish-white	.15	.35
344.	Beryl, hexagonal crystals in the rock	.25	.50
	Massive bluish	.10	.25
462.	Biotite, Ontario, Canada, black mica	.10	.20
58.	Blende or Sphalerite Joplin, Mo.	.10	.25
210.	Bloodstone, India, polished, green with red spots	.25	.50
698.	Boracite, France, crystals in gypsum	1.00	
707.	Borax, Borax Lake, California, single crystals, 25c.		
78.	Bornite, Granville Co., N. C.	.15	.35
481.	Bowenite, Smithfield, R. I.	.10	.20
740.	Brochantite, Mammoth, Utah, green drusy cavity specimens	.50	1.00
323.	Bronzite, Bavaria, Germany, coarsely bladed crystalline	.20	.35
253.	Brookite, Magnet Cove, Ark., black crystals on rhyolite	.35	.75
262.	Brucite, Hoboken, N. J., foliated pearl-white	.15	.35
	Nemelite, Hoboken, N. J., satiny fibriform	.20	.50
210.	Buhrstone, Stormstown, Pa., calcedonic jasper, cavernous	.10	.25
210.	Cairngorm stone or smoky quartz	.20	.35
423.	Calamine, Friedensville, Pa., Rhineland, Germany, crystallized	.25	.50
270.	Calcite or Calc Spar, rhombohedral cleavages	.15	.35
	Groups, England, Joplin, Mo., etc.	.25	.75
	Dog Tooth Spar, Joplin, Mo., large crystals or groups	.25	.75
	Nailhead Spar, Lawrence Co., S. D.	.25	.75
	Chalk, Dover Cliffs, Eng., earthy white	.10	.20
	Oolite, Karlsbad, Bohemia, oolitic	.15	.35
	Pisolite, Karlsbad, Bohemia, coarse oolitic	.25	.75
	Stalactites, Bisbee, Ariz.	.20	.35

		$1\frac{1}{2}$x2	2x3
	Calc Tufa, Montgomery Co., Ind., petrified moss	.10	.20
	Onyx Marble, Mexico, polished	.15	.35
360.	Cancrinite, Litchfield, Maine, orange in elaeolite syenyte	.20	.35
424.	Carpholite, Hartz Mts., Germany, fibriform, yellow, strawstone	.35	.50
248.	Cassiterite or Tinstone, Geyer, Bohemia	.25	.75
	Stream Tin, Durango, Mexico, gravel in bottle holders, 20c.		
	Catlinite, Pipestone, Minn., red polished tablets	.25	.35
720.	Celestite, Lansdowne, Canada, cleavable	.20	.50
	Groups, Gembeck, Germany	.75	
281.	Cerussite, Las Cruces, N. M., crystallized	.50	1.00
447.	Chabazite, Paterson, Nova Scotia	.20	.50
210.	Chalcedony, transluscent gray	.10	.25
474.	Chalcodite, Antwerp, N. Y., metalic drusy on hematite	.25	.50
268.	Chalcophanite, Ogdensburg, N. J., drusy black	.50	
83.	Chalcopyrite, Rowe, Mass.	.10	.25
270.	Chalk, Dover Cliffs, Eng., earthy white	.10	.20
398.	Chiastolite, Lancaster, Mass., crystal sections, polished, in mica schist	.25	.50
	Sections of free crystal $\frac{1}{2}$ to 1 inch across, polished 15c.—35c.		
	Long natural crystals, uncut, 25c.		
415.	Chondrodite, Edenville, N. Y., orange in calcite	.20	.35
241.	Chromite, Canada, massive black	.25	.75
504.	Chrysocolla, Mammoth, Utah, blue green	.25	.75
376.	Chrysolite or Olivine, Hall, N. C., granular greenish yellow	.20	.50
210.	Chrysoprase, Frankenstein, Germany, nickel green chalcedony	.75	1.50
481.	Chrysotile, Passaic Co., N. J., fibrous serpentine, banded "asbestos"	.20	.50
66.	Cinnabar, New Almaden, Calif., massive red	.50	1.00
316.	Clevelandite, Chesterfield, Mass., white lamellar albite	.10	.20

		$1\frac{1}{2}$x2	2x3
468.	Clinochlore, Chester Co., Pa., green micaceous	.15	.35
465.	Clintonite, Amity, N. Y., bronze red seybertite, stiff micaceous	.25	.50
89.	Cobaltite, Norway, metallic in the rock	.25	.35
525.	Columbite, Pennington Co., S. Dakota, massive cleavable	.25	.75
628.	Conichalcite, Mammoth Utah, small botryoidal in cavities	.75	1.50
15.	Copper, Keweenaw Point, Mich., in the rock	.10	.20
231.	Corundum, Laurel Creek, Ga., cleavable	.10	.25
	Ruby in smaragdite, Clay Co., N. C.	.25	.75
	Aluvial Ruby, Burma, in holder 25c.—1.00		
	Emery, Chester, Mass., with magnetite, massive	.10	.20
183.	Cryolite or Icestone, Greenland	.15	.35
224.	Cuprite, Arizona	.25	.50
400.	Cyanite or Kyanite, Litchfield Co., Conn., green bladed or columnar	.15	.35
396.	Danburite, Russell, N. Y.	.25	.75
401.	Datolite, New Jersey, Tyrol	.35	.75
564.	Descloizite, Mammoth, Ariz., drusy red brown	.35	.75
476.	Diabantite, New Jersey	.15	.25
256.	Diaspore, Chester, Mass.	.25	.50
325.	Diopside, Tyrol, groups	1.00	2.00
270.	Dogtooth Spar, Joplin, Mo., large crystals or groups	.25	.75
271.	Dolomite, common massive or crystalline	.10	.20
	Pearl Spar, Niagara Falls, N. Y., groups on limestone	.25	.75
	Teruelite, Teruel, Spain, black crystals 10c., 15c., in gypsum	.25	
338.	Edenite, Edenville, N. Y., gray hornblende groups	.25	.50
673.	Ekdemite, Mammoth, Ariz., yellow on wulfenite	.50	1.00
357.	Elaeolite, Magnet Cove, Ark., greasy brown lustre	.35	.75
231.	Emery, Chester, Mass., with magnetite, massive	.10	.20
323.	Enstatite, Bavaria, Germany, coarsely bladed crystalline	.20	.35

	$1\frac{1}{2}$x2	2x3
407. Epidote, Huntington, Mass., on actinolite	.15	.25
601. Erythrite, Schneeberg, Saxony, pink foliated tufts on quartz	.75	1.50
370. Essonite, Hessonite, Tyrol, Austria, cinnamon garnet groups	.25	.50
313. Feldspar, Delaware Co., Pa., common cleavable	.10	.25
327. Albite or Soda Feldspar, massive white	.10	.20
319. Labradorite, Labrador, blue gray or drab, coarse crystalline	.10	.20
210. Flint, Dover Chalk Cliffs, England, black nodular	.10	.20
277. Flos Ferri, Eisenerz, Styria, snow white, coralloidal	.35	.75
175. Fluorite, Macomb, N. Y., cleavable transluscent	.15	.35
Groups, Cumberland, England	.25	.75
277. Fountainstone, Karlsbad, Bohemia, light brown, banded	.20	.35
335. Fowlerite, Franklin Furnace, N. J., pink rhodonite	.15	.35
239. Franklinite, Franklin Furnace, N. J., massive black	.10	.25
Groups of crystals in the rock	.25	.75
45. Galena, Southampton, Mass., on quartz	.10	.20
Groups of crystals, Joplin, Mo.	.20	.50
370. Garnet common red	.10	.25
Grosularite or Lime Garnet	.25	.50
Hessonite, Tyrol, Austria, cinnamon garnet groups	.25	.50
Rosolite, Xalostoc, Mexico, pink garnet	.20	.35
Pyrope, Navajo, N. M., precious garnet, pebbles in holder	.25	.50
Almandite, Mass., Conn., in schist	.15	.35
Andradite, Phippsburg, Maine, lime garnet	.15	.35
Topazolite, Piedmont, Italy, yellow crystals on the rock	1.00	
483. Garnierite, Noumea, New Caledonia, nickel green massive	.25	.50
264. Gibbsite, Richmond, Mass., white on limonite	.25	.50

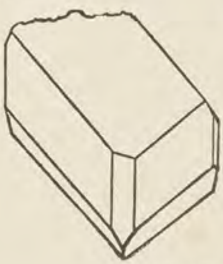
		1½x2	2x3
257.	Goethite, Felsoebanya, Hungary, velvet ore, crystallized	.50	1.00
2.	Graphite, Warren Co., N. Y., on quartz, foliated	.10	.25
746.	Gypsum, Grand Rapids, Mich., massive	.10	.20
	Selenite, cleavable transparent	.10	.25
	Crystals, Ellsworth, Ohio, 5c.–50c., twins 25c.–2.00.		
	Satin Spar, Derbyshire, England, silky fibriform	.15	.35
	Alabaster, white or pink, compact	.15	.35
166.	Halite or Rock Salt, Kansas, cleavable, transparent white	.10	.25
210.	Heliotrope or Bloodstone, India, polished, green with red spots	.25	.50
232.	Hematite, Frizington, England, specular iron with quartz, groups	.25	.50
	Kidney Ore, Cumberland, England, large botryoidal	.25	.50
	Red Ocher, Clinton, N. Y., earthy oolitic	.10	.20
370.	Hessonite, Tyrol, Austria, cinnamon garnet groups	.25	.50
438.	Heulandite, Paterson, N. J., group on trap	.15	.35
338.	Hexagonite, Edwards, N. Y., purple matted tremolite	.20	.35
338.	Hornblende, Eganville, Canada, black cleavable	.10	.25
	Groups of stout black crystals	,25	.50
300.	Hydromagnesite, Carinthia, earthy gray porous	.25	.50
324.	Hypersthene, Berks Co., Pa., coarse bladed black	.10	.25
393.	Idocrase or Vesuvianite, Sanford, Maine, yellow brown	.10	.25
	Crystals, Templeton, Canada, 25c.–50c.		
212.	Infusorial Earth, Nevada, Bohemia, opal earth	.10	.20
353.	Iolite, Conn., Norway, dichroic blue green	.25	.50
25.	Iron, native and meteoric, see Meteorites in the Contents		
801.	Jarosite, Mammoth, Utah, drusy yellow brown	.50	1.25
210.	Jasper, compact yellow, opaque	.10	,20
	Agate-Jasper, Honduras, brecciated	.15	.35

		1½x2	2x3
480.	Jefferisite, West Chester, Pa., brown mica tablets	.20	.50
492.	Kaolinite or Kaolin, New Jersey, clay	.10	.20
424.	Karpholite, Hartz Mts., Germany, fibriform yellow, strawstone	.35	.50
232.	Kidney Ore, Cumberland, England, large botryoidal	.25	.50
400.	Kyanite, Litchfield Co., Conn., green bladed or columnar	.15	.35
319.	Labradorite, Labrador, blue gray or drab, coarse crystalline	.10	.20
	Chatoyant, polished	.75	2.00
445.	Laumontite, New Jersey, radiated white crystals	.25	.75
574.	Lazulite, Lincoln Co., Ga., blue crystals in white sandstone	.35	.75
460.	Lepidolite, Maine, dark purple, crystalline micaceous	.15	.35
321.	Leucite, Monte Somma, Italy, crystals in lava	.15	.35
97.	Leucopyrite, Edenville, N. Y., metallic white in hornblende	.20	.50
	Lignite, New Jersey, columnar wood coal,	.10	.20
259.	Limonite, Edge Hill, Pa., botryoidal black surface	.20	.35
	Clay Ironstone, common limonite	.10	.20
237.	Lodestone, Magnet Cove, Ark., natural magnet, strong	.25	.75
	Lodestone, Magnet Cove, Ark., natural magnet, strong	.25	.75
210.	Lydianstone, Basanite, Langenstriegis, Germany, black jaspery quartz	.20	.50
272.	Magnesite, Greece, compact white	.10	.25
237.	Magnetite, Essex Co., N. Y., coarse crystalline	.10	.25
	Crystals, octahedral 5c.—35c., Parting crystals 10c.—50c.		
288.	Malachite, Copper Queen Mine, Bisbee, Ariz., velvet green	.20	.50
370.	Marble, common white	.10	.20
	Onyx Marble, Mexico	.15	.35

		$1\frac{1}{2}$x2	2x3
96.	Markasite, Joplin, Mo., coxcomb pyrites groups on chert	.20	.50
464.	Margarite, Chester, Mass., pearly pink foliated mica	.20	.50
232.	Martite, Millard Co., Utah, groups	.35	.75
485.	Meerschaum or Sepiolite, Asia Minor, Turkey, spherical masses, natural state	.35	.75
25.	Meteoric Iron, complete iron meteorites, 75c—$2.50		
270.	Mexican Onyx Marble, polished	.15	.35
	Micas, see Muscovite, Biotite, Phlogopite, Zinnwaldite, Lepidolite, etc.		
315.	Microcline, Pikes Peak, Col., large crystals or groups, blue, green	.35	.75
	Amelia, Va., cleavable, green	.15	.35
210.	Milky Quartz, vitreous white	.10	.20
70.	Millerite, Lancaster Co., Pa., velveted acicular masses, pure	.50	1.50
98.	Mispickel, Arsenopyrite, Freiberg, Saxony	.15	.35
34.	Molybdenite, Saxony, foliated, lead gray	.35	.75
537.	Monazite, New York City, crystals in oligoclase	.75	
	Monazite Sand, McDowell Co., N. C., in tubular holders, 15c., 25c.		
210.	Moss Agate, India, polished, green	.25	.75
458.	Muscovite, Common Mica, cleavage plates	.10	.20
	Magnetited Mica, dendritic	.10	.25
453.	Natrolite, Guttenberg, N. J., Aussig, Bohemia, needle crystals	.25	.75
262.	Nemalite, Hoboken, N. J., satiny fibriform brucite	.20	.50
357.	Nephelite, elaeolite	.15	.35
71.	Niccolite, Hessen, Germany, metallic coppery	.50	1.00
259.	Ocher, brown or red	.10	.20
561.	Olivenite, Utah, crystallized	.35	1.00
376.	Olivine, Chrysolite, Hall, N. C., granular greenish-yellow	.20	.50
270.	Onyx Marble, Mexico, polished	.15	.35
270.	Oolite, Karlsbad, Bohemia, oolitic	.15	.35
210.	Salicified Oolite, Center Co. Pa., pseudomorphous	.10	.25
212.	Opal, Mexico, precious in the rock	.25	.75

No.		$2\frac{1}{2}$x2	2x3
	Wood Opal, Washington, yellow green	.20	.50
	Wax Opal, Hungary, reddish yellow	.20	.50
	Hyalite, Mexico, Canada	.25	.75
	Opal Agate, Mexico, banded	.25	.50
	Tripolite, opal earth, Nevada, white, Bohemia, brown	.10	.20
27.	Orpiment, Hungary, lemon yellow to golden, foliated	.50	1.00
	Reniform Orpiment, botryoidal surfaces	.75	2.00
313.	Orthoclase, Delaware Co., Pa., cleavable	.10	.25
	Simple crystals, Colorado, 10c–35c, Karlsbad twin crystals, Bohemia, 10c–50c. Adularia, Switzerland, twinned crystal groups	.50	1.00
467.	Ottrelite, Ottrez, Belgium	.35	
	Ozokerite or Native Paraffin, Galicia	.25	.50
25.	Pallasite, siderolite meteorite, Kansas, complete, 75c.—$1.25.		
271.	Pearl Spar, Niagara Falls, N. Y., groups on limestone	.25	.75
270.	Peastone or Pisolite, Karlsbad, Bohemia, large oolitic	.25	.75
330.	Pectolite, Paterson, radiated white	.20	.50
	Guttenberg, N. J., columnar, phosphorescent	.25	.75
327.	Pericline, Swiss Alps, groups	.35	
210.	Petrified Wood, Petrified Forest, Arizona, variegated red	.15	.35
462A	Phlogopite, Burgess, Canada, brown mica	.10	.25
	Pipestone or Catlinite, Pipestone, Minn. red polished tablets	.25	.35
270	Pisolite or Peastone, Karlsbad, Bohemia, large oolitic	.25	.75
20.	Platinum, S. Am., scaly "sand," in bottle cap stands $1.00—$1.50.		
411.	Prehnite, New Jersey, translucent green	.20	.50
269.	Psilomelane, Saxony, black botryoidal	.25	.75
85.	Pyrite or Iron Pyrites, groups, metallic yellow	.25	.75
254.	Pyrolusite, Germany, radiated 35c., 50c., crystallized groups	.75	2.00

	$1\frac{1}{2}$x2	2x3
550. Pyromorphite, Ems, Germany, groups	.50	1.50
325. Pyroxene, loose crystals 5c.—35c.	.35	.75
74. Pyrrhotite, Penn., niccoliferous, metallic yellow	.25	.75
210. Quartz		
Rock Crystal, transparent crystals, groups	.25	.75
Loose crystals, long, slim, water clear, 5c.—25c.		
Amethyst, purple crystal groups	.20	.50
Rose Quartz, pink, massive	.10	.25
Smoky Quartz, tapering smoky brown crystals	.20	.50
Milky Quartz, white, massive	.10	.20
Blue Quartz, bluish white to purple black, massive	.25	.50
Chalcedony, clear transluscent gray	.15	.35
Carnelian, Brazil, clear red chalcedony, cut and polished 25c.		
Heliotrope or Bloodstone India polished, green with red spots	.25	.50
Agate, Brazil, variegated, polished	.35	.75
Moss Agate, India, polished, green	.25	.75
Agate Jasper, Honduras, banded, brecciated	.10	.25
Agatized Wood, Petrified Forest, Ariz., variegated red	.15	.35
Flint, Dover Chalk Cliffs, Eng., black nodular	.10	.25
Basanite, velvety black, flinty jasper	.10	.35
Jasper, clear opaque yellow	.10	.25
26. Realgar, Hungary, crimson on rhyolite	.75	1.50
274. Rhodochrosite, Hungary, light pink	.50	1.50

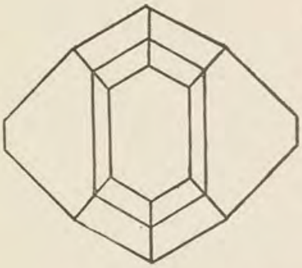


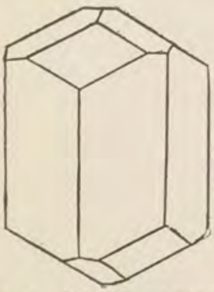
335. Rhodonite, Fowlerite, Franklin Furnace, N. J., pink	.20	.50
Rose Quartz, pink massive	.10	.25
426. Rubellite, pink lithium tourmaline in lepidolite	.25	.75
231. Ruby, corundum, alluvial, Burma, in holder, 25c—1.00, in smaragdite, N. C.,	.25	.75

	1½x2	2x3
Ruby Spinel, Ceylon, in holder, 20c—50c		
250. Rutile, Ark., Norway, black	.35	
166. Salt, native or Rock Salt, Halite, Kansas, cleavable transparent white	.10	.25
529. Samarskite, N. C., brilliant metallic black	.75	1.50
746. Satin Spar, Derbyshire, Eng., silky fibriform gypsum	.15	.35
277. Satinstone, Eisenerz, Styria, satin white aragonite	.15	.25
387. Scapolite, Common or Wernerite, Bolton, Mass., lilac to dark purple	.10	.25
814. Scheelite, Zinnwald, Bohemia, light brown crystals on quartz	.35	.75
371. Schorlomite, Ark., massive black	.20	.35
746. Selenite, cleavable, transparent	.10	.25
Crystals, Ellsworth, Ohio, 5c.—50c., twins 25c.—$2.00.		
485. Sepiolite or Meerschaum, Asia Minor, Turkey, spherical masses, natural state	.35	.75
481. Serpentine, massive green	.10	.25
Chrysotile, fibrous serpentine, "asbestos"	.20	.50
465. Seybertite, Amity, N. Y., bronze red, clintonite, stiff micaceous	.25	.50
273. Siderite, Roxbury, Conn., coarse crystalline spathic iron,	.10	.25
Sphaerosiderite, Hungary, botryoidal	.25	.75
14. Silver, native, in the rock, 25c.—75c.	1.00	
87. Smaltite, Saxony, metallic white	.50	1.50
275. Smithsonite, Rhineland, Germany	.25	.75
484. Soapstone or Steatite, translucent white talc	.10	.25
683. Soda Niter, Tarapaca, Chili, crystalline granular in bottle holders, 10c.—20c.		
362. Sodalite, Litchfield, Me., blue in syenite	.20	.50
56. Sphalerite, Mo., cleavable zinc blende	.10	.25
"Black Jack," Eng., Hungary, groups	.25	.75
Ruby Blende, Mo., groups	.25	.75
234. Spinel, New York, Canada, black octahedra in calcite	.50	1.50

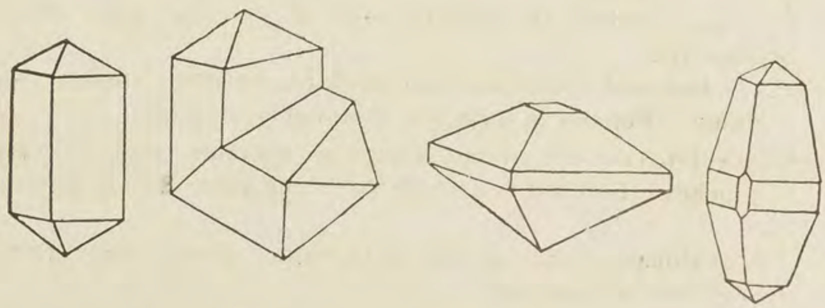
		1½x2	2x3
	Pleonaste, Tyrol; Italy, brilliant black drusy in cavities	.50	1.00
	Spinel Ruby, Ceylon, aluvial in bottle holders, 25c.		
327.	Spodumene, Mass., white tabular	.20	.50
428.	Staurolite, N. H., in garnetiferous schist	.15	.35
	Oblique and right cross twins, Ga; France 15c.—35c.		
	Simple prismatic crystals, altered to chlorite 10c.—25c.		
484.	Steatite or Soapstone, translucent white talc	.10	.25
28.	Stibnite, New York, gray antimony ore	.10	.25
443.	Stilbite, N. J., Nova Scotia, radiated sheaf and crystal groups	.15	.35
474.	Stilpnomelane, Chalcodite, Antwerp, N. Y.	.20	.50
719.	Stinkstone or Fetid Barite, black crystalline. fetid odor when rubbed.		
248.	Stream Tin, Durango, Mexico, cassiterite gravel in bottle holder, 20c.		
280.	Strontianite, Germany	.20	.50
	Succinite or Amber, Baltic Coast, Germany, fossil gum	.35	.75
3.	Sulphur, Sicily, Italy, groups, lemon yellow	.25	.75
484.	Talc, Ga., blue green, foliated	.10	.25
	Soapstone or Steatite, translucent white talc	.10	.25
271.	Teruelite, Teruel, Spain, black dolomite crystals 10c., 15c., in gypsum	.25	
502.	Thaumasite, Paterson, N. J., massive white	.25	.50
456.	Thomsonite, Colorado, botryoidal, acicular crystalline	.25	.75
406.	Thulite, N. C., pink zoisite in albite	.15	.35
210.	Tiger Eye, Africa, polished, fibriform yellow	.35	1.00
510.	Titanite, Canada, crystals in the rock	.50	1.50
	Loose crystals, wedge shaped 10c.—75c.		

		1½x2	2x3
397.	Topaz, Utah, crystals on rhyolyte	.35	.75
	Maine, massive white	.25	.50
	Loose crystals, Utah, brilliant, modified 5c—25c.		
426.	Tourmaline, Mass., columnar crystals in quartz	.10	.25
	Black crystal groups, New York	.35	.75
	Loose crystals, brown and black, 10c.—25c.		
	Rubellite, Calif., Me., pink lithium tourmaline in lepidolite	.25	.75
255.	Turgite, Pa., red hydrous iron ore	.20	.50
642.	Turquois, N. Mexico, blue in trachyte, 10c., 15c.,	.25	
552.	Vanadinite, Arizona, red crystals in groups	.35	.75
611.	Variscite, Ark., bright green, drusy on chert	.25	.50
393.	Vesuvianite or Idocrase, Me., brown crystalline	15	.35
	Loose crystals, square prisms, brown, 25c.—50c.		
597.	Vivianite, Mullica Hill, N. J., after belemnites, bladed black, 35c., 50c.,	.75	2.00
700.	Warwickite, Warwick, N. Y., small black crystals in limestone	.20	.50
639.	Wavellite, Ark., radiated concentric green on chert	.20	.50
387.	Wernerite, Common Scapolite, Bolton, Mass., lilac to dark purple	.10	.25
381.	Willemite, Franklin Furnace, N. J., massive green, reddish	.20	.50
	Troostite, flesh-red to brown crystals in calcite	.35	.75
812.	Wolframite, Zinnwald, Bohemia large iron black crystals 50c., 75c.		
329.	Wollastonite, New York, bladed white	.20	.30
210.	Wood Agate, Petrified Forest, Ariz., variegated red	.15	.35





	1½x2	2x3
212. Wood Opal, Washington, yellow green	.20	.50
818. Wulfenite, Ariz., N. M. Corinthia, groups, yellow or red	.50	1.25
536. Xenotime, New York, crystals in oligoclase	.75	
209. Yttrocerite, Edenville, N. Y., violet or purple or silver mica	.25	.75
Zeolites, see Heulandite, Stilbite, Chabazite, Analcite, Natrolite, etc.		
228. Zincite, Franklin Furnace, N. J., red in white calcite	.25	.50
461. Zinnwaldite, Zinnwald, Bohemia, pearl gray mica	.25	.50



394. Zircon, New York, Canada, crystals in the rock	.50	1.50
Loose crystals, acute form, 10c.—75c.		
406. Zoisite, Mass., columnar, gray	.10	.25
Thulite, pink in albite	.15	.35

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