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PRECIOUS STONES.

By George Frederick Kunz.

In the United States there was considerable activity in the mining of precious stones in 1907, especially the tourmalines of Oxford county, Maine, a number of which were cut by local lapidaries. Of special interest was the finding of small quantites of spodumene of variety similar to that found at Pala, California, called kunzite. This spodumene was also found of a sea-green color, which, when heated, would change to lilac and violet. The great event of the year was, of course, the discovery of diamonds in Arkansas. This is discussed at length in a subsequent part of this article.

Turquoise.—Turquoise was worked at four places during 1907, but, although a quantity of material has been obtained up to the present time, very little of the fine blue variety has been secured.

A new and interesting find of turquoise has been made near Las Vegas, Nevada. The turquoise is the blue and blue-green material usually found near the surface. The trachyte rock in which it occurs strongly resembles that occurring near Los Cerrillos, New Mexico. Only a depth of 4 ft. has been dug, but for the depth the color of the turquoise is excellent.

An interesting variety of turquoise, attached to a peculiar trachyte matrix, was found near Austin, Nev., and has been extensively cut in the form of cameos, some of which measure from 2 to 3 in. in diameter. The most charming contrast is obtained when the subject is cut in blue, relieved by a background of the fawn-colored matrix.

Amethyst.—A locality for amethysts was found a few years ago in Nelson county, Va., near Lowesville, which I have described elsewhere.[1] The find consisted of a large, decomposed vein, the gangue rock being almost entirely missing through the decay of rocks. The region covered about 100 acres, with pockets scattered over the same and apparently did not extend down to any depth. These amethysts were unusually fine in quality. They occurred in a pegmatite rock and the crystals were more or less irregularly colored, like the finer stones that are found in Chitanka (Perm), Ural mountains, or the water-worn amethysts from Ceylon, and differing from

[1] "Mineral Resources of the United States," p. 851, 1902.

those found in the amygdulas of igneous rocks in Brazil and Uruguay, and at Thunder Bay, Lake Superior. The color is more unequally distributed, but for this reason, when cut, they are much more brilliant and frequently show not only a purple, but a red light. The finest gem found here was shown at the Jamestown Exposition, and was a heart-shaped stone weighing 114 carats, of the most gorgeous purple, rivaling the richest-colored wine.

During 1907 this locality was extensively worked. Many hundred tons of gangue rock were removed and some thousands of gems were mined, cut, and sold to the jewelry trade. Many of these are of unusually rich color, the largest stones weighing from 50 to 150 carats. A great many gems were obtained that were a pale pink, or almost lilac, but possessing the same brilliancy as the darker purple stones and forming very beautiful and interesting gems.

Kunzite.—Kunzite was worked at several places in California, but the quantity obtained during 1907 was not commensurate with the demand. An attempt has been made to sell the stock of a mine of the almandite garnet crystals which occur so plentifully on the Stickeen River, Alaska, seven miles from Fort Wrangell. These garnets appear as unusually brilliant crystals, occurring in numbers, a dozen or more together, in a compact gray mica schist, and are sold extensively to visiting tourists. But a great number of these specimens have been tried by lapidaries, with the disclosure of imperfection in the interior, which is more or less opaque, or only slightly translucent. On account of this defect, their use as gems will be very doubtful.

Hiddenite.—Some development work was carried on at the emerald and hiddenite mine at Stony Point, Alexander county, N. C., during the summer of 1907. Some small beryls, emeralds, and hiddenite were found, in value not exceeding a few hundred dollars. Preparations were made for continuing the work at some future time.

Chalcedony.—The most splendid specimens of chalcedony, colored blue and green by silicate of copper, have been found in the Copper Queen mine in the Globe district, Arizona. This mineral is frequently in thin layers, with a coating of chrysocolla; sometimes, the entire material is one evenly-distributed mass of green chalcedony and then a layer of chrysocolla coated by quartz. This chalcedony is unusually beautiful, the most striking resembling turquoise in color, but it is somewhat harder and less likely to change its hue, as the chalcedony is not as absorbent as is the turquoise. This green chalcedony has been cut extensively in Arizona and New Mexico, and also by the jewelers in the East, in the form of ring-stones, seal-stones, and, in exceptional cases, of spherical beads, which are quite as beautiful as any of the best turquoise. Single pieces of this material weighing some ounces each have been found, worth $100 to $300. It is known as "copper silicate" chrysocolla. I have offered "azurlite," or "azurchalcedony," as a substitute.[1]

In San Diego, Cal., there has been found a variety of chalcedony impregnated with a manganese mineral or stained by manganese, the color being somewhat similar to that of triphylite; for this, because of its peculiar purple tint, the name violet or mangan-chalcedony has been suggested.

Azurmalachite.—I have given the name "azurmalachite" to the natural mixture of azurite and malachite which sometimes occurs in concentric layers, as in the form of stalactites, or as botryoidal masses, which, when cut crosswise, show regular or irregular bands, rings or markings of the blue azurite combined with the green malachite. This material is found at Bisbee and at other copper mines in Arizona. The naming of the stone has been a result of the introduction of a quantity of this material in the less expensive forms of jewelry; the stones being cut for cuff-buttons, rings, scarf-pins, etc. Neck-pieces also, in the form of spherical beads, offer, in their irregular blending of blue and green, a pleasing and attractive effect.

Utahlite.—During 1907, there was found in Colorado a serpentine of the most intense chrome green color that has been observed anywhere, closely resembling the green of the utahlite, a variety of variscite from Dugway, Utah. However, this serpentine is translucent, and not amorphous in texture as is the latter.

Utahlite itself has been more or less worked at the new locality found two years ago, and a quantity of gems have been obtained which are excellent in color; these were frequently cut where a band across them produced an effect resembling that of the cat's-eye. Under the belief that another name than utahlite would insure a better sale these stones have been given a popular selling name (not a scientific name) by the dealers who call them "amatrice."

Californite.—The interesting californite, so closely resembling jade, but really a compact idocrase or vesuvianite, has been found at a new locality in Tulare county, several miles east of Exeter. The new California occurrence is of a pleasing apple-green color. It appears in veins that vary from 2 to 4 in. in thickness, associated with serpentine in a serpentinous rock. A very limited amount has been mined and sold, perhaps not exceeding in value a few thousand dollars.

Rose Quartz.—Rose quartz of magnificent coloring and size has been found in Riverside county, California, at a point in the Coahuila mountains where a lode, varying from 3½ to 6 ft. in thickness, remains to be developed. A new and unique use for this beautiful substance is that to which it will be put by Miss Agnes V. Luther, teacher of natural science in the Normal and Training School at Newark, N. J. She has obtained a mass of many

[1] New York Academy of Sciences, April, 1907.

hundred pounds at the Kinkels feldspar quarry near Bedford, Westchester county, N. Y., and has had it made into a tombstone and placed in the old Indian cemetery at Saybrook, Connecticut. Rose quartz, however, has the reputation of losing its color by exposure to sunlight, and for this reason has not generally been regarded as suitable for out-door uses; but I have seen glaciated surfaces of deep pink color in the Black Hills and the outcrops retained their color. Miss Luther's experiment will be interesting as a test.

Agatized Wood.—Agatized, chalcedonized, or petrified wood, as it is called, has been used by Charles Mead in building his home at New England, Hettinger county, North Dakota, in the neighborhood of which it occurs. The house stands on the edge of a bluff, overlooking the Cannonball river, and forms a striking object of color and brilliancy. The material has been left in its original condition, and the wall is unpointed; as the petrified wood contains cavities with coarse crystals, the play of light on its surface produces a beautiful effect. This material is not so fine as that found in Chalcedony Park, Arizona, but in one tract of three acres in extent the specimens are so thick that tons can be obtained with little difficulty.

Benitoite.—One of the most interesting of the new gems found in the United States is the mineral called benitoite, a stone from California, described by Prof. George Davis Louderback, of the University of California.[1] This remarkable blue gem resembles the blue spinel rather than the sapphire and, like the spinel, it has a peculiar brilliancy of its own. The mineral was discovered early in 1907 by Mr. Hawkins and T. Edwin Sanders, who were prospecting in the southern part of the Mt. Diablo range near the San Benito-Fresno county line, about latitude 36° 20′. It was first brought to Prof. Louderback's attention by Shreve & Co., a San Francisco firm, who had purchased one of the cut stones from a lapidary and who were later offered some of the rough material as sapphire. Investigation at the University proved it to be an undoubtedly new mineral species, and it was called benitoite, as it occurs near the headwaters of the San Benito river in the county of the same name.

The most striking outward characteristic of this mineral is its fine blue color, and selected crystals cut in the right direction produce a beautiful gem-stone that rivals the sapphire in tint and excels it in brilliancy. The color, however, although fairly characteristic, is not an essential property, for parts of a crystal are often colorless, while occasionally small crystals are entirely so. The color also varies in intensity in different crystals or in parts of the same one. When pale it is rather a pure blue; but when more intense it assumes a violet tint. Besides this variation in color in different parts of crystals, there is a difference at any one point, depending

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[1] "Benitoite, A New California Gem Mineral," by George Davis Louderback, with Chemical Analysis by Walter C. Blasdale; University of California, Bulletin of the Department of Geology, Vol. V, No. 9, pp. 149-153.

on the direction in which the light passes; in other words, the mineral is strongly dichroic, the ordinary ray being colorless and the extraordinary being blue. A section cut parallel to the basal plane is practically colorless, while sections parallel to the principal axis show the deepest tint. To get the finest effect, therefore, gems should be cut with the table parallel to the principal axis; this is the reverse of the sapphire, which shows its color best when cut perpendicularly thereto. If such a section, cut so as to give the strongest color effects, be examined with a dichroscope, the contrast between the images is most striking. The image of the extraordinary ray, being freed from the colorless image of the ordinary ray, presents a remarkable intensity of color, very much deeper, of course, than can be seen by looking at the mineral in any direction with the unaided eye. In the lighter parts this color of the extraordinary ray is a slightly greenish blue inclining to indigo as it becomes darker, and is very similar to one of the axial colors shown by some colites (cordierites); but in the more highly-colored or thicker parts it is an intense purplish blue. The color is not affected by heat, up to the melting point of the mineral. Fragments brought to a rather bright red and maintained at that heat, just short of fusion, for five minutes, showed no change whatever on cooling.

Benitoite occurs generally in individual simple crystals scattered through a matrix of and varying from a few millimeters to about 2 cm. across. The matrix being translucent white, the blue transparent crystals stand out prominently, often showing well-defined faces.

Benitoite and carlosite, a new microclinic mineral with a hardness of between 5 and 6, occur as individual disseminated crystals in narrow veins in a basic igneous rock or in a schist which has been considerably altered by the solutions that formed the veins. The benitoite is apparently restricted to the veins, the carlosite also occurring in the neighboring parts of the wall rock. The chief gangue of the veins is a soda-rich zeolite.

Benitoite crystallizes in the hexagonal system, trigonal division. The observed forms are the basal plane, the plus and minus trigonal pyramid and the corresponding trigonal prisms. The normal angle between the basal plane and the pyramid is about 40° 14′. If the pyramid be taken as a unit pyramid of the first order, this would yield an axial ratio of 0.7327, if of the second order, 0.8460. The most common habit is pyramidal, one pyramid being the chief form, the other occurring as a small but regular and brilliant truncation. One or both prisms may be present as narrow truncations and also a small triangular basal plane. No tendency towards a prismatic habit was observed. The angles between two adjoining pyramid faces at one end of the axis is 68° 1′. There is an imperfect pyramidal cleavage. The fracture is conchoidal to subconchoidal. The hardness is 6¼ to 6½; distinctly above orthoclase and labradorite and below chrysolite and quartz; specific gravity, 3.64 to 3.65.

The refractive index is quite high, a feature which adds greatly to the beauty of the cut stone. For the ordinary ray it is about 1.77 (sodium light), for the extraordinary, about 1.80. The double refraction is therefore very strong and the mineral optically positive. Basal sections show a perfect uniaxial cross which gives a distinct positive reaction with the mica plate. This mineral fuses quietly to a transparent glass at about 3. It is practically insoluble in hydrochloric acid, but it is quite easily decomposed by hydrofluoric acid. Slowly attacked by melted potassium pyrosulphate, it dissolves readily in fused sodium carbonate. Benitoite has proved to be of much interest from the standpoint of its chemical composition which is new and unusual. The suggested formula is $BaTiSi_3O_9$, which yields the following calculated values: SiO_2, 43.71 per cent.; TiO_2, 19.32; BaO, 36.97; total, 100.

ANALYSES OF BENITOITE. (a)

	A.	B.	Average	Mol. Ratios.
SiO_2	43.56	43.79	43.68	.723
TiO_2	20.18	20.00	20.09	.250
BaO	36.34	36.31	36.33	.237
	100.08	100.10		

(a) As reported by Prof. W. C. Blasdale.

Benitoite is then a very acid titano-silicate of barium, and stands in a class by itself, both among acid silicates and titano-silicates. The possibility of the titanium acting as a base was considered, but the summation of the analyses and the fact that the crystals are often perfectly colorless seem to point definitely to the above interpretation. The blue color of much of the material may be due to a small amount of titanium in the sesquioxide condition.

Both chemically, and as a gem-stone this is a most interesting addition to American minerals. It is to be regretted that its hardness is less than 7, so that it is not as durable for gem purposes as sapphire or spinel. The stone has been found only very sparingly and up to the present can be considered mineralogically a rare gem.

Sapphire.—So far, the most noble blue gem, one of the four precious stones which has not been in as great favor as the diamond, the ruby, or the emerald, is at last coming into fashion. With it, the color blue is also becoming more in vogue. The result is that sapphires of every clime are worn and with them has come the demand for not only the finest Oriental, but also the finest American blue stones. Strange to say, however, the gem of from two to four carats is a rarity in the United States. Great quantities of beautiful blue stones from ½ to 1¼ carats each have been found, and the two mines in Fergus county were productive until the panic of 1907.

Since then not so much mining has been done. The stones of various colors, found in Granite county and at Eldorado Bar were also much worked, but, with the slump in many industries, there was less demand for them.

During 1907 some rolled sapphire crystals from an unknown locality in Colombia were shown to me; white, colorless, yellow and pale blue; in hexagonal crystals, flat and barrel-shaped. In general character they resembled the Montana gems found on the Missouri river near Helena, at Eldorado Bar. They were quite perfect and would cut into gems of fancy quality. With them was some cyanite and also some spessitite garnets in small grains of ½ carat each. This is the first recorded finding of sapphire from this part of South America; their nearer locality could not be ascertained.

Emerald.—After many vicissitudes, and after having offered every possible form of concession in order to have them worked, the historic mines of emerald belonging to the Colombian government are in the hands of President Rey, who has under consideration the placing of a loan of about $2,500,000, which is to be secured by the mines, the interest to be met by the profits from these virtually unique mines of fine emeralds, with over three centuries of history.

DIAMONDS.

The financial crisis in the United States in the fall of 1907 affected very seriously the diamond industry of South Africa. America had been for several years the largest purchaser of diamonds; and the changed conditions here soon began to show themselves in a great falling off in the importation of luxuries. The result was alarming to the diamond companies, and steps were at once taken to reduce the output and prevent serious losses from an overstocked market. The De Beers company had been taking out 30,000 tons of rock per day, working its five mines for six days of 24 hours each week. In a short time the hours were reduced to one-half, and subsequently the days were made five instead of six. In April, 1908, the Dutoitspan mine was shut down; this had furnished over one-third of the company's output. By these various steps the total yield was reduced to 11,000 tons per day. All the other companies either restricted their output or suspended operations entirely, only the more important ones continuing work at all. The Premier, by agreement with the De Beers company in December, shut down portions of its plant, and lowered its output by about 30,000 carats a month, which would represent over 80,000 tons. In addition to these business difficulties, a series of labor troubles in the form of strikes in Antwerp and Amsterdam resulted in the going out of more than 10,000 diamond-cutters, who, on May 4, 1908, had not yet returned to work. All these causes have had a direct bearing on the imports and created a tendency to steady the market; and there has been no break in the prices, nor is there likely to be, since the Syndicate intends to restrict the output until the visible supplies in the jewelers' hands are virtually exhausted. In the face of this fact, the strike of the diamond-cutters revealed that an effort was being maintained to keep up the price of polishing. Negotiations were started by the Federation of Employers with the Diamond Syndicate and the Premier Diamond Company for taking measures to restore confidence in the trade, and thus bring the diamond industry back to its normal aspect.

Diamonds in the United States.

No further diamond discoveries have been made in the drift of either Wisconsin or Indiana, nor is there knowledge of any diamonds having been found at the two places in California and Kentucky where prospecting has been carried on since 1906 and where there were supposed diamond-bearing deposits. We have, however, to note what is believed to be the first occurrence of diamonds in a matrix of kimberlite on the American continent (diamonds have never been found in the true matrix in the Guianas or in Brazil). This discovery was made near Murfreesboro, Pike county, Arkansas, in August, 1906, and together with Dr. Henry S. Washington I was permitted to investigate the locality. The geographical conditions, the character of the deposits and the methods of working will be briefly explained.[1]

Geology.—The geology as well as the petrography of this interesting locality has been well described by J. C. Branner and R. N. Brackett.[2] Briefly summarized, the igneous rock in which the diamonds are found is a vitreous peridotite, forming a stock or volcanic neck, which has broken up through Carboniferous and Cretaceous quartzites and sandstones. After an extensive period of erosion, during which an unknown portion of the neck and presumably a previously existent volcanic cone were removed, the surface was covered with thin beds of post-Tertiary conglomerate. The volcanic intrusion was accompanied by the formation of several small dikes of a rock much like that of the main body. One of these dikes cuts across the stock, while another cuts the Cretaceous sandstone, but is overlain by the conglomerate, thus giving a datum for the period of intrusion. So far as known, there was little, if any, metamorphism of the country-rock by the igneous magma, which probably followed an approximately vertical course, so that a more or less vertical extension downward of the igneous body to indefinite depths may be expected. This result should hold good, at least for the upper and most accessible portions, though

[1] "Diamonds in Arkansas," by George F. Kunz and Henry S. Washington; *Trans.*, A. I. M. E. (New York Meeting, Feb., 1908), pp. 187-194.
[2] *Am. Journ. of Science*, Third Series, Vol. XXXVIII, pp. 50 to 59 (1889); and *Annual Report* of the Geological Survey of Arkansas for 1890, Vol. II, pp. 377-391 (1891).

some departure from a strict verticality may be expected at greater depths.

As above remarked, the igneous rock is a peridotite which, in fresh hand-specimens, is tough, hard, distinctly porphyritic, and very dark greenish- or brownish-black. Microscopic study shows it to be composed of numerous crystals of olivine and some patches of biotite, imbedded in a groundmass of very small crystals of augite, perofskite, and magnetite, with an abundant yellowish to colorless glassy base. In all the specimens examined the olivines are more or less completely serpentinized, and the glass is apt to show an aggregate polarization due to decomposition. The rock is evidently an igneous intrusive, which probably welled up in comparative quiet, and solidified not far from the surface. It is therefore in no sense a volcanic breccia, due to explosive eruptions, as are most of the South African occurrences. Chemically and mineralogically, however, it much resembles the South African rock, although there are certain points of difference—notably the absence of inclusions.

Peridotites are generally prone to alteration by weathering. In this instance the freshest rock is dense, hard and tough, and does not crumble markedly on exposure, as is shown by the fact that the highest points in this igneous area are outcrops of fairly fresh peridotite. The first state of pronounced alteration is the disintegration of the firm rock into a mass of hard, angular fragments, varying in size from that of a bean to that of a human fist, which apparently do not readily disintegrate on exposure to the weather. The second stage of alteration, due to further weathering, yields a compact mass, the so-called "green ground," showing various shades of light olive green, and often bluish in tint when moist, but becoming yellowish on drying. The third stage of alteration, found nearer the surface, furnishes, from still further oxidation of the ferrous iron, the so-called "yellow ground," which resembles the "green ground" in physical characters, but is, in color, distinctly brownish-yellow, with little or no trace of green. The green ground and the yellow ground are soft and friable, crumble readily between the fingers, and show soft, but sharply defined, serpentinous pseudomorphs of the original olivine crystals, with well-preserved outlines. This fact, supplemented by the general appearance of the texture, shows clearly that the peridotite has been decomposed in place, and that there has been little or no transportation of the material.

Both the green and the yellow grounds, if dry, crush under a gentle pressure to a fine powder, containing small gritty particles of the less decomposed minerals, which can be readily sifted out. If wet, the rocks disintegrate rapidly, especially with mechanical agitation, to a fine, somewhat sticky mud, which can be easily washed or otherwise treated.

The fresh, compact peridotite crops out at the surface, forms several small hills along the northwest border of the deposit, and is also visible at other points; and the first fragmentary alteration-product shows itself at a few spots; but the green and the yellow grounds are found over by far the greater part of the igneous area, either on the surface or, more frequently, immediately beneath a thin layer of black, sticky, "gumbo" soil. The maximum and average depths of this mass of decomposed peridotite have not yet been exactly ascertained; but borings show it to be, in places, 40 ft. thick. This fact, together with other considerations, leads us to estimate the average thickness to be not less than 20 ft. Below this is found either the fragmentary, or a more or less compact, igneous rock. One drill-hole has penetrated the peridotite to a depth of 205 ft., another to 186 ft., and a third to 80 ft.—all remaining in igneous rock to the end, as was to be expected, in view of the geologic structure.

The surface original exposure of the igneous area forms a rough ellipse, about 2400 ft. in major and 1800 ft. in minor diameter. The area known to be underlain by peridotite is estimated at about 40 acres, though further prospecting of the neighboring alluvium-covered bottom-land to the south may possibly add to this amount.

General Conditions.—A variable supply of water, usually abundant, is furnished by the Little Missouri river, which flows a short distance to the southwest of the igneous area. This stream, though somewhat low at certain seasons, never runs dry, and may safely be counted on to provide a sufficient supply of water for all mining purposes. For certain installations, however, its rapid and sometimes serious rises must be taken into consideration. The owners of the igneous area possess, also, a large tract of land, along both sides of this stream, with the incident water-rights. A large portion of the land under control is well wooded; and extensive forests, chiefly of pine, with some oak, promise a good supply of cheap timber for some years to come. Coal may be readily purchased at a reasonable cost from the bituminous fields of Arkansas, Oklahoma, or Texas.

Although the region is not thickly settled, and the nearest towns are small, the experience of the lumber companies indicates that an ample supply of labor (chiefly white) will be available; indeed, the lumber-camps themselves may be an immediate source of supply. In this connection an obvious, and possibly serious difficulty may be mentioned; namely, the liability of the loss of diamonds through theft by the laborers. With the class of labor employed at the South African mines, a system of detention in compounds, thorough physical examination for hidden diamonds, and other methods for the prevention of theft or the recovery of stolen stones, can be carried out; but in the United States it may be impossible to employ, at least in a thorough-going manner, safeguards of this character. Up to the present time, a small force of picked men having been employed in the preliminary operations, and about 300 diamonds having been found, there is little or no ground for the belief that any serious loss of this kind has occurred. But work on a greater scale, involving the employment of a large number of laborers of less trustworthy character, with increased difficulties of adequate supervision, will augment this risk, the prevention of which will be a serious problem.

Transportation facilities for coal, machinery and other supplies are furnished by two short branches from theIron Mountain Railroad. One (a private lumber road) leaves the main line at Prescott, and extends 26 miles to Nathan, about six miles from Murfreesboro, while the other runs from Gurdon on the main line about 30 miles to Pike City, distant about 10 miles from Murfreesboro. Only very rough roads now connect these terminals with the diamond bearing locality; but these roads will be improved and a new railroad to Murfreesboro is in process of construction and will be completed within one or two years.

Factors to be Determined.—Up to the present time about 300 diamonds have been discovered within the igneous area, while none has certainly been found outside of it, even in the immediate vicinity. All the stones have been found on the surface, except two, which were in the concentrates derived from washing large amounts of the green ground, and one, which was imbedded in the green ground itself about 15 ft. beneath the surface. My careful examination of this last specimen, confirmed by Dr. R. W. Raymond, leaves no doubt that the diamond is actually in place in the rock and was not inserted in the specimen. Consequently it furnishes a definite proof that the peridotite is the source of the diamonds, and that all the stones so far discovered have been derived from it. It would be well, however, to have this single piece of evidence corroborated by similar specimens. With regard to the quantitative relations of the diamonds to the inclosing rock, about 200 carats have been found on or immediately beneath the surface, where presumably there has been considerable concentration of the stones. From the nature of the deposit, the average yield per ton can be ascertained only by actual washing or other extraction from the rock on an extensive scale, commensurate with that of the contemplated commercial operations.

Additional factors of economic importance for which more extensive data are necessary, are the average size, color and quality of the stones, since these factors determine their value. From the 200 carats at present available for examination, it appears that the Arkansas locality compares very favorably with most, if not all, of those in South Africa. Although no stones larger than 6.5 carats have yet been found, the average size is fairly good. There is a large proportion of white stones, for the most part of a high grade in color, brilliancy, and freedom from flaws. Indeed, many are as fine as have ever been found. Some of the yellow ones, also, are of exceptional quality and color. As the white stones are among the finest material found, there will be little competition with some of the African mines, where, as a rule, the quality is not of so high an order.

The method of extraction of the diamonds is of vital interest and importance. The green and the yellow grounds offer no difficulty, and are amenable to the methods used in South Africa. Indeed, in Arkansas, there is no need for prolonged exposure to the weather, since the freshly extracted material disintegrates and can be washed with ease. The amount of this easily worked material "in sight" is very large; yet it is not of indefinite extent downward, as is the "blue ground" of Kimberley; and, consequently, its extraction will form but a transient phase of future exploitation.

The economical extraction of the diamonds from the compact, and relatively fresh and hard, peridotite, underlying the "green ground" and forming the vast bulk of the mass, will involve study and experiment. But, apparently, there will be no greater difficulties than have been successfully overcome in South Africa. In view of the hard, tough, and fresh character of the peridotite which composes the highest points of the area along the northwest border, it might be thought that the material underlying the green ground would be of the same character and equally refractory; but the diamond drill shows that, at least for considerable depths, a large proportion of the underlying peridotite is far more decomposed than that which crops out at the border; is, indeed, so far altered that much of the material comes up as sludge, and no continuous cores longer than 14 in. have been obtained. Many of these cores were so soft as to be readily scratched with a knife. Probably this more compact material will disintegrate on exposure to the weather, like the South African "blue ground." If this be the case, a large proportion of the mass will not be difficult to work.

At some portions of the mass, however, as at the northwest border, and probably in depth beneath the rest of the area, fresher and much more refractory material will be encountered, the treatment of which will present practically the same problem as that of the hard portions of the African rock which do not disintegrate on exposure. While a certain amount of crushing, in order to extract the diamonds, is apparently unavoidable, this should be reduced to a minimum, on account of a high loss from breakage of the stones themselves. Several methods of treatment suggest themselves, which are at present under consideration; but the practical details, as well as the economic features, remain to be worked out and cannot be discussed here. The non-magnetic character of the diamond and its tendency to adhere to grease are obvious features which can undoubtedly be used at certain stages of the extraction for all classes of material in the Arkansas deposit, as in South Africa.

A Word of Warning.—In view of the great local excitement over the discovery of diamonds, which has extended over part of the State, and in view of the danger of the repetition here of the disastrous history of many mining camps which have undergone an unwarranted "boom," and the consequent rush, with loss of time and money by many innocent individuals, it should be distinctly understood by the public that the occurrence of diamonds near Murfreesboro is an isolated one, and that it does not resemble a mineral vein or lode in any respect. Consequently, there is not the least justification for any such claims as will undoubtedly be made by ignorant or unscrupulous parties, that "a continuation of the vein" has been struck. There can be no continuation of a vein when there is no vein.

In 1908 a new small artery of peridotite was located about two miles from the original deposit, and about three miles from Murfreesboro. Up to the present, no stones are said to have been found on the new exposure.

Should other similar igneous areas, which may possibly be diamond-bearing, be discovered elsewhere, any claims put forward for them should be received with the greatest caution. Fortunately, the characteristics of the peridotite (in which, by analogy, diamonds may be most reasonably expected to occur) are so easily recognizable by a petrographer, the localities will be presumably so isolated, and the outlines and extensions of the mass so well defined, that the report of a geologist or petrographer can surely prevent an unsuspecting or ignorant person from loss by investment in a property said to be a continuation of, or a connection with, the present deposit. Peridotites are not uncommon, but very few are diamond-bearing. Indeed, the great majority of these rocks found all over the world show no trace of diamonds. Even in South Africa, many peridotite pipes, resembling valuable ones, carry no diamonds, while in any given pipe some portions are found to be richer in diamonds than others.

As shown by J. F. Kemp,[1] many basic dikes have been found in Arkansas; but most of these differ petrographically from the Murfreesboro peridotite, and there is no reason to think that any of these, or any of the several syenitic areas of the State, is connected with diamond-bearing rocks. As has been noted above, two dikes of peridotite occur in connection with the Murfreesboro igneous area. Great stress is laid locally on these dikes, or "leads," as they are called, but without warrant, since there is no reason to think they contain diamonds, and in any case they are too small to be of economic value. From analogy with other igneous intrusions, it is probable that more dikes will be discovered in the neighborhood, radiating from the main stock; and in other localities the presence of dikes of similar rock, which could only be identified by petrographical means, would be an indication of the possible presence of a larger body of peridotite in the vicinity. If diamonds are present, they are to be looked for in the rock-mass itself, or in its products of weathering, and not only along the

[1] J. F. Williams, *Annual Report* of the Geological Survey of Arkansas for 1890, Vol. II, pp. 392-406 (1891).

contacts, because they are integral portions of the igneous mass, and their presence is not due to the circulation of hot water and solutions along the contact between an igneous mass and the country-rock.

For the last 15 months active prospecting and developing have been going on in the search for diamonds in the Murfreesboro area. A washing-machine has been installed, and it is now proposed to make a trial test of some ten thousand or more loads to prove definitely to what extent the diamonds occur here.

Diamonds in South Africa.

De Beers.—From the 19th annual report of the De Beers Consolidated Mines, Ltd., for the fiscal year ending June 30, 1907, it appears that the receipts from diamond sales were £6,452,596 ($32,262,980); from this there was deducted a total expenditure of £3,845,356 ($19,226,780), leaving a net profit of £2,607,240 ($13,036,200). After the payment of dividends amounting to £2,550,000 ($12,750,000), the year's balance, which included something from the balance of the previous year, was £932,623 ($4,663,115).

The year's output was 9,010,686 loads as against 8,144,979 during the previous year; the figures for the amount crushed being 6,626,291 loads and 5,625,592 loads, respectively. The accumulated stock of blue ground was augmented by 2,622,477 loads and amounted in all to 9,391,603 loads at the close of the fiscal year. Development work for the year totaled 165,613 ft. of drifts, tunnels and raises, and 1703 ft. of rock and prospect-shafts.

DETAILS OF COST AND PRODUCTION, 1906-1907.

Mine.	Output of Blue Ground for Year.	Yield per Load.	Value per Carat.	Value per Load.	Cost per Load.		
					Min. (b)	Wash.	Total.
	Loads. (a)	Carat.					
De Beers	1,525,184	0.37	$15.55	$5.76	$1.21	0.74	1.95
Kimberley	578,669	....	9.87	....	1.72	0.99	2.70
Wesselton	2,104,308	0.32	10.45	3.16	0.86	0.51	1.37
Bulfontein	2,320,538	0.32	10.15	3.31	0.95	0.54	1.49
Dutoitspan	2,481,987	0.24	19.10	4.54	0.97	0.60	1.57
	9,010,686	....	....	....	....	....	....

(a) The load contains 16 cu.ft. and weighs about 1600 lb.
(b) Including the cost of handling waste rock.

Premier.—This immense mine, which has rapidly become a formidable rival of the De Beers company, made notable progress during 1907. The figures for the 12 months ending Oct. 31, 1907, are reported at 6,538,669 loads washed, with an average yield of 0.29 carats per load, and a total production of 1,889,986 carats of diamonds, valued at £1,702,630. While these figures are enormous in amount, and compare well with those of De Beers, it is to be noted that the average value per carat of the diamonds found here (18s. 0.2d.) is only about one-fifth of that shown at the De Beers group as given in the above table. Still, the mine is one of extraordinary possibilities. The amount of blue ground in sight is estimated by the president, Mr. Cullinan, at 500,000,000 loads, or nearly eight times that at the De Beers mines, as reported in December, 1906. Mr. Cullinan, in his address, discusses the prospect of carrying on open working to a depth of 1200 or 1500 ft.; although shaft-sinking will in time become necessary. But the present open system can be continued for perhaps nine years, with the great improved plant now being installed, and may in that time deal with about 136,000,000 loads. Meanwhile, the year's record shows a marked reduction in costs of operation, which were 2s. 4.14d. per load, as against 3s. 5.7d. in the previous year, and 4s. 7.2d., or nearly double, in 1903. In the months that have passed since October, the cost have been further reduced to 1s. 9.31d. in January, 1908. This steady diminution of expense is attributed by the president to improved modes of treatment, on a large scale, with the most carefully studied methods and the best apparatus, and he predicts that it may be even further lowered.

The enormous Cullinan diamond (the Edward VII as it is to be known) found at this mine in 1905, has been presented as a gift from the people of the Transvaal colony to King Edward VII, and will be the most remarkable treasure among the crown jewels of Great Britain. This result was reached only after much discussion; but it was approved by a large majority of the colonists, and was undoubtedly the wisest disposal of such a unique object. The only alternative would have been to divide it into a number of large stones, thereby destroying its extraordinary individuality. The cutting is being done at Amsterdam, with the most elaborate precautions at every step, the stone having already undergone the process of cleavage. It has been cleaved into three large pieces. The largest piece is of such size that a dop nearly eight inches across and a polishing wheel fourteen inches in diameter are required to polish it. It will afford a brilliant of between 550 and 600 carats. Nothing will be done with the others until this is cut, as the greatest diamond known will be cut from one of the smaller pieces even if an accident occurs to the largest.

Other African Mines.—In 1905, the Roberts Victor Diamond Mine was opened at Boshof, Orange River Colony, and since that time the "yellow ground" has yielded many nodular masses of eclogite, a rock composed of garnet and an emerald-green pyroxene with cyanite. Much interest attaches to these occurrences, as similar masses of eclogite have been found at the Newlands mine in South Africa, and also at Ruby Hill, near

Bingara, New South Wales; and diamonds have been reported as occasionally found in them at both localities, certainly at the former.

It is now stated by G. S. Corstorphine that eight diamonds, one or two being well-formed octahedrons and weighing $\frac{1}{5}$ or $\frac{1}{8}$ of a carat, have been found in one of these nodules at Boshof. There has been considerable discussion as to the origin of these eclogite boulders, as they are termed; but, in Mr. Corstorphine's opinion, they are concretionary nodules, formed either by segregation or differentiation in the original magma, and hence are to be compared with the olivine nodules that appear in certain localities. The same view is strongly urged by A. W. Voit, in an important paper presented to the South African Geological Society in July last, on "Kimberlite dikes and pipes."[1] On the other hand, Mr. Johnson, in a communication to the same Society,[2] argues for a different origin of these eclogite masses. He describes in detail several types of them, some of which present a conspicuous banded, but not concentric structure. They "contain in proportionate abundance all the characteristic minerals of the eruptive diamond-bearing breccia"; and hence he is led to the view that they represent residual and more resistant portions of a rock that has gone to make up the ordinary kimberlite, and that this was the real home of the diamonds. The so-called boulders are often tabular in form and banded in structure, suggesting an origin from a deep-seated rock formation rather than from an igneous magma. When seen in place, they are sharply differentiated from the matrix, with no suggestion of segregation. Their surfaces, when taken out, are seen to be worn and smoothed, as though by attrition, the inclosed garnets being cut through and worn down. The banded structure is frequent, but it is linear and never concentric. Mr. Johnson therefore regards them as true boulders, broken from underlying rock and worn by attrition in the pipe.

Vaal River Diamonds.—An important decision by Dr. Hans Merensky has lately appeared in the *South African Mining Journal* (April 4, 1908), as to the origin of the diamonds found in the valley of the Vaal river. These are widely distributed in gravels and placers, which became noted as the "river diggings" before the discovery of the great "pipes" at Kimberley, and which are still extensively worked and yield diamonds of fine quality. They have been discussed a good deal of late, especially by T. Lane Carter, in 1903, and by Gardner S. Williams of the De Beers mines.[3] The general opinion has been that the Vaal diamonds must be derived from pipes similar to those of Kimberley, but not yet located; and Mr. Carter announced the actual discovery of such a pipe, and its partial exploitation. Dr. Merensky, however, presents a different view. He lays emphasis upon the well-known fact that the Vaal diamonds have an

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[1] *Trans.* Geol. Soc. of South Africa, Vol. X, 1907 (read July 22, 1907) pp. 69-79.
[2] *Ibid.*, Vol. X. 1907 (read Aug. 12, 1907), pp. 112-114.
[3] *Eng and Min. Journ.*, Sept. 5, 1903; "Min. Res. of the U. S.," 1903, p. 918, and 1904.

aspect quite distinct from those derived from any of the "pipe" mines, and that the occasional pipes and fissures found by extensive search in the region have proved to contain but few and small diamonds, all of which are strictly of what he terms the "kimberlite type," different from that of the placers. Some other source must, he thinks, be sought for the latter.

The Vaal diamonds occur in deposits of debris from the disintegration of diabase and related rocks, concentrated here and there by stream action, but showing no signs of much transportation. They are associated with various forms of quartz, jasper, agate, etc., and with amygdules from diabasic rocks. The diggers, moreover, state that they find diamonds on steep kopjes, where river deposit is out of the question, and also that old diggings yield a fresh supply after a few years. In view of all these circumstances, Dr. Merensky believes that the Vaal diamonds have their source in the diabase itself, which is widely distributed over the entire area where they occur, and that they are still being released by the weathering of the rock. These diabasic rocks are referred by the South African geologists to the Ventersdorp system, which is earlier than the Karroo beds, with which all the "pipes" of kimberlite are associated; and hence the two modes of occurrence would differ not only in the nature of the enclosing rock, but also in its geological age.

This view, which Dr. Merensky presents as a tentative one, requiring further investigation, derives additional interest from the discovery of diamonds in a dolerite dike, in the Inverell district of New South Wales, reported in 1904. [1] It is true that the rocks are different in the two cases, but both are igneous; and the suggestion afforded by these indications in both Africa and Australia is that diamonds may prove to be a not very infrequent content, though rarely abundant, in basic igneous rocks of several kinds.

Diamond Mining in Brazil.

Much attention has been given recently to the diamond fields of Brazil and the possibilities of greatly enlarged production in that country. The area of diamond-bearing deposits is very extensive, but the obstacles and limitations have been so great that comparatively little has been done. These have consisted in two things, viz., inacessibility and lack of transportation on the one hand, and on the other, crude, primitive methods and lack of machinery. It appears that both of these conditions are soon to be changed, and then may come a very large development of diamond production in Brazil. American capital is becoming interested, and has already gained control of much of the richest country in the Diamantina region. The work already begun has led to a demand for more and better

[1] Min. Res. of the U. S., 1904.

means of transportation; and American engineers and American wagons have been called into the field. Railroad connections are to be opened to Diamantina, the mining center of the State of Minas Geraes, which has heretofore been reached only by rough wagon-roads or on mules or horses; and the superiority of American-built wagons, introduced by some of the companies, has already attracted much attention from the authorities of the State. Dredging machinery has been installed along the Jequitonhonia river; and with it will come a revolution in the diamond production of the region that, it is claimed, may be felt throughout the world. The stones will not average as high as the African in size and the yield may not be a permanent one, as it is all from new gravels.

Heretofore, the Brazilian output has gone to Europe; but with the new conditions above noted, it is now turning to America. The diamond exports from Brazil, so far as reported, at least, were $310,000 in 1906,—double the value of 1905. These figures, however, are believed to be much below the actual output. They include also the carbons, or carbonados, from the State of Bahia, which are in great and increasing demand, at high prices.

It is of interest in this connection to note that Dr. J. C. Branner, of Leland Stanford University, and formerly of the Brazilian and Arkansas geological surveys, spent some six months in Brazil in 1907-1908 and found in his explorations that the carbonade region covered at least one-third more area than had been supposed, and, as the new district was unworked, this means that the world's supply will be nearly doubled. Dr. Branner also found that the area of the old diamond-fields is much more extensive than had been supposed.

Although the total imports of precious stones into the United States for January, February, March and April, 1908, amounted to but $1,540,000, one-third of this sum ($500,000) represented the carbon, carbonado, or industrial bort, as it is known, from the province of Bahia, Brazil. This large importation was owing to the very high price of this material at present, viz., from $70 to $80 per carat of 205 milligrams,[1] or at the rate of $12,000 per oz.; while the crystalline bort used to pulverize into diamond dust, and also employed to some extent in marble-sawing, sells from $1 to $2 per carat, or only $\frac{1}{40}$ to $\frac{1}{80}$ of the price of the other much more highly prized amorphous material.

Caution is needed, however, in regard to the subject of Brazilian mining enterprises, as a number of projects have been presented in New York for the purpose of developing tracts of diamond-bearing earth in that country. It is claimed by those who are competent to judge, that many of these are

[1] The proposed metric carat of 200 milligrams first proposed by G. F. Kunz at the International Congress of weights and measures held at the World's Columbian Exposition, Chicago, 1903, is being agitated and adopted in some countries. For full discussion, see The Book of the Pearl, by George F. Kunz and Charles Hugh Stevenson, 565 pages, 100 plates, The Century Company, New York, 1908.

of problematical nature; and that with others the titles can be perfected only with the greatest difficulty, as the mines have passed through the hands of many owners, and the heirs, legitimate and illegitimate, frequently number more than a hundred, so that it is almost impossible to gain a clear title in a reasonable time, if indeed at all. It would seem that a process of condemnation by the Brazilian Government might be legislated, thus aiding in the development of an industry and preventing the frequently recurring losses to so many who needlessly suffer failure.

Other Precious Stones.

Sapphire.—The Queensland sapphire fields are in the Anakie district, Central Queensland, on the Central Queensland Railway. They are all found in the alluvial deposits and are "panned" or dry cradled in the absence of water. The production has been as follows, the value per ounce being stated in brackets: 1903, £7000 (15s.); 1904, £10, 700 (15s.); 1905, £5,255 (15s. to £1); 1906, £18,110 (£ 1.4); 1907, £30,000 (£1.4); total to date, £64,065 (15s. to £1.4). Unfortunately little of the material is a transparent blue; it is generally more or less dark, and has frequently been used for stones for seal rings. The population of the Anakie district now amounts to 1100, in five places, the principal of which are Sapphire town, Policeman creek, New Rush, and Tomahawk creek. Most of the material is sent to Germany and the United States.

Burmese Tourmalines.—C. S. George, deputy commissioner of the ruby-mines district in Burma, gives an account of the manner of working for tourmalines, of which the red variety, rubellite, the Chinese ruby, is found in that region and has always been greatly prized. It occurs in distinct crystals in the cavities in granitic rocks—probably pegmatite veins similar to those in which the same mineral is found in Maine, Connecticut, and California. The method of mining is to sink a vertical shaft 4 or 5 ft. square, into the upper decomposed portion of such a vein; this shaft is known as a *twinlon* mine, the same name that is applied by the natives to similar shafts sunk into the ruby-bearing gravel in the search for that gem. From this vertical shaft, the owner is usually granted the right to extend horizontal galleries underground to a radius of 30 ft. Of course, when any shaft has proved productive, others are sunk along what is supposed to be the line of the vein, but frequently without success. The best tourmalines are never found at a less depth than 50 ft., the average depth being 60 or 70 ft. The material excavated is brought up from the shafts in small bundles, elevated by extremely long bamboos set on a pivot and counterweighted; the tourmaline is then sorted out by hand.

Seven years ago, an important find of red tourmaline, or rubellite, was made at Hpai Baing (Milaunggon), where, in former times, the Chinese had worked; a more recent one is at Htauka, between Milaunggon and Sanka. Early in 1905, another rich vein was discovered near Sanka village.

Australian Topaz.—Among the Australian gems brought to light in recent years are topazes weighing from ½ to 8 oz. each, blue, green and white in color. These have been found in various places on the Australian continent, notably near Torrington, New South Wales, where they were found in place with crystals of quartz; and at Stanhawk, Queensland, where they appeared in the form of water-worn pebbles, the crystalline faces being entirely obliterated; but they are of a beautiful deep-blue color, very similar to the large, water-worn crystals found at Oban in New South Wales, where they adhered to crystals of quartz, associated with wolframite in a matrix of clay at Heffanan's Lease. Some of the individual crystals measured 2 in. in hight, and 2½ in. in diameter. They were invariably striated and broken across. At the Gulf, near Emmaville, New South Wales, beryl has been found imbedded in and associated with quartz, one crystal being bluish green, over 2 in. in length and nearly 1 in. in diameter. It has also been found at Packenham, Victoria.[1]

Opal.—Among the many unusual forms of precious opal found near White Cliffs, New South Wales, there were specimens that were pseudomorphs of a mineral, either glauberite, gaylussite or gypsum; these were groups of crystals, which, from their peculiar forms, were termed "pineapples;" frequently, however, they consisted entirely of good opal material. There were also other pseudomorphs after wood, the woody structure being still visible, although replaced by precious opal. Besides these, were pseudomorphs from shells and from reptilian bones and teeth, especially saurian vertebrae; one of these measured 3 in. across. In addition to this, there has been found, within the past few years, a deposit of black opal of wondrous, splendid fire, the reds, greens, and blues predominating, usually of from ⅛ in. in thickness to 1 in. or more. But the largest part of the deposit was found to be either entirely black, or else with a decidedly smoky tint. This has given us an opal possessing a velvet black groundwork through which a brilliant display of fire is apparent. The best deposit of black opal was found at Lightning Ridge, New South Wales, at a depth of 30 ft. One mass discovered weighed 78 oz., and was valued at more than £1000. These are the first localities from which have been derived these dark stones, to which superstition might assign the property of bringing good fortune to the owner, in contradistinction to the ill-luck attributed to the more usual varieties by Sir Walter Scott and others. These black opals have been cut into gems weighing from ¼ to one carat each, and have formed a valuable addition to the gem family.

Jade.—During 1906 and the early part of 1907 there were discovered some immense masses of jade (nephrite) at the western end of New Zealand.

[1] C. Anderson, Mineralogist, Records of Australian Museum, Sydney, pp. 69-79.

These were great, water-worn boulders, exceeding in size any specimens ever found in Australasia; the largest two pieces weighed 4228 and 2968 lb. respectively. They were brought to the attention of Tiffany & Co., who imported them and, through the characteristic generosity of J. Pierpont Morgan, Esq., they were presented to the American Museum of Natural History. Here they are shown in connection with the immense piece which I discovered in Silesia in April, 1899, weighing 4712 lb. This specimen was found in the bed of an old serpentine quarry used for road material; it was of much greater toughness than the material in the quarry and the quarrymen had therefore passed it by. This mass is of the same variety as nephrite and there is enough material in it to make all the archaeological jade objects on the European continent five times over. A special interest was associated with this find because it was long believed that all the nephrite and jadeite objects found in Europe, in the Lake dwellings and elsewhere, had an Asiatic origin and had been brought to those places in the migration of the early races.

Jadeolite.—Several handsome and interesting green minerals, more or less resembling jade, and suitable for similar ornamental uses, have lately been brought into notice. One of these is a remarkable, deep-green, chromiferous syenite, found at the jadeite mine at Bhamo, Burma, and frequently cut into gem-stones. I have suggested the name "jadeolite" for this beautiful and interesting material.

Verdite.—During 1907 there was found on the south bank of the North Kaap river, in South Africa, two miles above Kaap station, another somewhat similar ornamental stone that has the deep green color of the chromiferous syenite, just mentioned as found in connection with the jade of Burma. It has a hardness of about three, and is susceptible of a high polish; the color is a rich chrome green and the stone contains a chrome-muscovite and some argillaceous material. Occasionally it has yellow or red spots. This stone is obtained in blocks weighing one ton or more and it is now sold in England at the price of £18 to £40 per ton. The name verdite has been suggested for it.

Style and Fashion—Commercial Conditions.

In regard to matters of style and fashion in jewelry, the demand for green stones has been unprecedented. The emerald, tourmaline, peridot, the rich green jade, amazon-stone, New Zealand jade or nephrite, and even malachite, have been more or less sought. Jade of every kind has been brought into the United States and worked and carved into an endless variety of forms. There is the rich carving of the Chinese, and the jade is frequently mounted in designs that are Chinese in character and are often executed by skilled Chinese jewelers.

During the latter part of 1907 the blue stones have been much in evidence, and the sapphire has once more come into positive favor, resulting in the use of sapphires of all shades and qualities, and the introduction of lapis-lazuli as well as the blue azurite, found in New Mexico. More attention is paid at the present time than ever before to the harmonious agreement in color with her costume of the jewels which a lady may wear, so that, while not suitable for rich decoration, many of the minor jewels are frequently worn in the form of beads, either round, facetted, ellipse-shaped, or flat antique in form. Such chains are sometimes varied by the alternation of a pearl or a piece of crystal cut flat, or else every second bead is followed by a pearl. Then again such combinations as amethyst beads alternated with a rich green jade from Burma, either plain or carved, are fashionable.

During 1907, what are known as calibre cut stones were extensively sold. These stones are usually brilliant or table-cut and range from a millimeter or slightly larger to greater sizes; they are generally square, or at least have two parallel edges so that they may be slipped into a continuous setting without any gold or other metal mounting between them, and the edges of the setting hold the stones securely. When the jewels are square, oblong, round or oval, they are mitered on two sides, the metal edges holding them in place. By this means it is possible to make unusually interesting and beautiful settings, such as continuous bands or circles of red, blue, or green, or else these same stones are alternated with diamonds, or two or three colored stones may be placed with a white diamond intervening.

From January until October, 1907, there was an unprecedented trade in precious and semi-precious stones in the United States. The importations were never greater, and the material was frequently such as commanded the most expensive and often extravagant prices. The demand was for every form of precious stone, and pearls in every quality. Emeralds from the finest to the poorest, and sapphires, the gem last to feel the dictates of fashion, were imported in greater quantities than ever before. At the same time diamonds, from the largest cut stones to the minutest, were in equal demand; down to the small stones of single brilliant cutting, generally of the whitest material, numbering 100 to 250 to the carat, in other words, from 15,000 to 37,000 to the ounce.

November and December saw a great falling-off in the imports of diamonds and other precious stones, and this continued through the winter and spring. The total imports of precious stones, cut and uncut, in 1908 for the months from January to May inclusive, amounted to but $2,000,000 in comparison with $12,000,000 worth imported in the same period of 1907. As elsewhere mentioned, $500,000 of this sum represented the imports of carbonado, or what is known as industrial bort; hence the value of the precious stones imported was really only $1,500,000. This great decrease was due to several causes, the principal one being that the unprecedented imports of 1907 and the sudden cessation of speculative activity resulting from the panicky times induced smaller imports of jewels and caused retrenchment on the part of jewelers, whether cutters or retailers, who preferred to diminish their stocks until times were more propitious.