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GEMS AND PRECIOUS STONES.

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INTRODUCTON.

A review of the production of precious stones in the United States for the last five years shows that for very few of them is the value year by year at all constant and that for many of them the fluctuation is very great.

The value of beryl, exclusive of emerald, has remained fairly constant within the limits $1,600 to $2,600. Emerald included, the production of beryl has varied greatly and in general has decreased.

Californite is showing a slow but gradual increase, but the heavy production in 1907, 1909, and 1910 makes the output of the last five years seem almost insignificant.

Chrysoprase is also again slowly increasing in production, but the total of $234,545 from 1906 to 1911 makes the total of $1,345 from 1912 to 1915 look very small.

Diamonds have remained fairly constant, according to the published figures, although statistics for the production from Arkansas are not available. The values reported are those of isolated and scattered finds and seldom exceed a few thousand dollars annually.

Feldspar gems, garnet, peridot, rhodonite, and topaz have a relatively small and irregular production, which varies within rather narrow limits.

The production of quartz gems nearly doubled in 1915, amounting to $35,725, compared with $18,838 in 1914, $16,861 in 1913, and $21,779 in 1912. The largest items among the quartz gems are chalcedony and agate. The production of agate, chalcedony, and jasper increased appreciably in 1915, whereas that of amethyst, gold quartz, quartz crystal, smoky quartz, and rose quartz decreased.

Opals reached their maximum production in 1913, but since that year the output has greatly declined.

The production of sapphire from Montana, which fell from $238,635 in 1913 to $60,932 in 1914, increased to $88,214 in 1915.

Tourmaline shows a slight increase in value for 1915 over the two previous years, but the production in 1915 of $10,969 is small compared with $50,000 to $133,192 in the years from 1905 to 1909.

Turquoise has had about the same production for the last four years, but the total output for the four years from 1912 to 1915 is less than the production for any single year from 1908 to 1911 and for any single year from 1897 to 1905. The production of variscite was the smallest since 1907.

The comparison for different years indicates that agate and chalcedony are the only gems that show a marked increase. Californite, beryl, chrysoprase, rose quartz, tourmaline, turquoise, and variscite show decrease in production, the remaining gems, sapphire, feldspars, garnets, spodumene, opal, peridot, topaz, rhodonite, and others of less importance show an irregular and varying output from year to year.

PRODUCTION.

The total production of gems and precious stones in the United States in 1915, as reported to the Geological Survey, was valued at $170,431. The production for 1914 was $124,651, the lowest since 1898, and that for 1915 is the second lowest.

Value of precious stones produced in the United States, 1911–1915.

	1911	1912	1913	1914	1915
Agates, chalcedony, onyx, etc.	$8,128	$9,978	$8,895	$8,312	$23,262
Amethyst	725	363	389	255	122
Benitoite	.....	150	.....	.....	.....
Beryl, aquamarine, blue, pink, yellow, etc.	2,505	1,765	1,615	2,395	1,675
Californite	150	275	152	1,425	[a] 1,535
Chiastolite	25	.....	.....	.....	.....
Chlorastrolite	1,992	350	.....	.....	[b]
Chrysoprase	13,550	220	.....	75	1,050
Copper ore gems, chrysocolla, malachite, etc.	800	1,085	2,350	1,280	1,120
Cyanite	.....	10	.....	.....	[b]
Diamond	2,750	1,475	6,315	765	608
Emerald	9,500	2,375	.....	.....	.....
Epidote	.....	10	.....	.....	.....
Feldspar, amazon stone, sunstone, etc.	175	1,310	1,285	449	368
Garnet, almandine, pyrope, hyacinth, etc.	2,065	860	4,285	1,760	4,523
Gold quartz	1,700	1,900	300	1,050	[c]
Hematite	.....	.....	.....	.....	126
Jade	.....	.....	.....	300	.....
Jasper, petrified wood, bloodstone, etc.	2,240	6,005	5,275	4,700	8,503
Opal	1,875	10,925	15,130	1,114	[d] 1,850
Peridot	360	8,100	375	100	[b]
Phenacite	.....	.....	.....	.....	[b]
Prase	.....	.....	25	.....	.....
Pyrite	.....	265	50	.....	1,042
Quartz, rock crystal, smoky quartz, rutilated quartz, etc.	2,140	2,448	1,640	4,046	[e] 2,437
Rhodonite	1,300	550	165	1,050	85
Rose quartz	1,744	865	337	400	350
Ruby	210	2,260	200	100	.....
Rutile	.....	.....	.....	.....	[b]
Sapphire	215,313	195,505	238,635	60,932	88,214
Smithsonite	25	650	50	50	[b]
Spodumene, kunzite, hiddenite	75	18,000	6,520	4,000	[b]
Thomsonite	1,500	450	.....	21	[b]
Topaz	2,675	375	736	1,380	862
Tourmaline	16,445	28,200	7,630	7,980	10,969
Turquoise and matrix	44,751	10,140	8,075	13,370	11,691
Variscite, amatrice chlorutahlite, utahlite	5,750	8,450	6,105	5,055	3,867
Miscellaneous gems	3,224	4,408	2,920	2,287	6,172
	343,692	319,722	319,454	124,651	170,431

[a] Including $10 vesuvianite not californite.
[b] Small production included under miscellaneous gems.
[c] Small production of gold quartz included under quartz.
[d] Including $225 wood opal.
[e] Including gold quartz.

The table of production aims to give the first value of the rough material. The value of the cut and polished gems is several times greater. The completeness and accuracy of the figures of production depend on the assistance of the gem miners and dealers, and their help is greatly appreciated. It is hoped that those few who have hesitated to furnish statements of production will cooperate in the future, on realizing that the individual statistical information

furnished by them is considered confidential and that only the combined figures of production are published. The Geological Survey conducts a large correspondence on the subject of precious stones, and accurate information furnished by the individual producers enables the Survey to put intending purchasers of rough material directly in touch with them.

Under miscellaneous gems in the table of production are included apatite, calamine, chlorastrolite, crocidolite, cyanite, datolite, fossil coral, Iceland spar, lazurite, obsidian, peridot, phenacite, rutile, smithsonite, spodumene (kunzite), staurolite, thomsonite, titanite, and zircon.

RANK OF STATES.

Montana leads all the other States in the value of precious stones produced in 1915, a position it has held for the last five years. The output consists chiefly of sapphires, which constituted almost one-half of the total value of all precious stones produced in the United States in 1915. Moss agate was also a considerable item, the value ranking next to that of sapphires. Montana also produced some garnet and Iceland spar in 1915.

California ranks second in value of precious stones produced, the larger items being tourmaline, jasper, chalcedony, and agate, vesuvianite (californite), and spodumene (kunzite). Small quantities of beryl, garnet, rock crystal, smoky quartz, rose quartz, chrysoprase, topaz, diamond, and lazurite were also produced. A large production of kinradite, the spherulitic jasper from the vicinity of San Francisco, is noted.

Nevada produced chiefly turquoise and opal, with smaller outputs of copper ore gems and variscite.

Colorado produced various precious stones, jasper and chalcedony having the greatest value. Pyrite, smoky quartz, and feldspar gems were also produced, as were garnet, rock crystal, amethyst, rose quartz, turquoise, topaz, hematite, phenacite, and rhodonite.

Arizona produced chiefly turquoise and also garnet and the copper ore gems. Small outputs of smoky quartz, chrysoprase, onyx, agatized wood, crocidolite, peridot, obsidian, and jasper were reported.

Utah produced chiefly variscite; New Mexico, turquoise; Alaska, garnet; Virginia, staurolite; Maine, the pegmatite minerals, tourmaline, topaz, beryl, and smoky quartz; and Arkansas, diamond, rutile, garnet, rock crystal, and smoky quartz.

Value of precious stones produced in 1915.

Montana	$105,355
California	22,312
Nevada	6,333
Colorado	5,987
Arizona	4,998
Oregon	4,252
Utah, New Mexico, Alaska, Virginia, Maine, Arkansas [1]	16,952
Other States [2]	4,242
	170,431

[1] Production of each State more than $1,000 and less than $4,000.
[2] Massachusetts, Michigan, North Carolina, New Hampshire, Idaho, South Dakota, Connecticut, Minnesota, Kansas, Pennsylvania, New York, South Carolina, Texas, Wyoming. Production of each State less than $1,000.

BERYL.

CALIFORNIA.

Additional samples of blue beryl from a prospect in the Death Valley region of California have been sent to the Survey by Mr. Joseph Ward, of Lone Pine, Cal. The light to dark-blue beryls are practically opaque, the transparent variety having apparently not yet been found.

More or less transparent pink beryls continue to be found in the gem mines at Pala, San Diego County, Cal. Mr. M. M. Sickler has submitted several such crystals that were found during 1915. Similar crystals were also obtained from the Pala Chief mine and the Tourmaline King mine.

CONNECTICUT.

Prof. W. N. Rice, of Wesleyan University, Middletown, Conn., reports the discovery of a beautiful crystal of golden beryl found at East Hampton (formerly Chatham). The crystal is now in the Museum of Wesleyan University.

GEORGIA.

Mr. A. J. Scoggins, of Dewcyrose, Ga., reports an abundance of beryl in various places in Elbert County, Ga. About two dozen beryl crystals of an aquamarine blue color have been obtained from a pit 5 feet deep near Antioch Hill mine. Several bushels of fractured deep-blue beryls were picked up on the surface near the Yellow Hill mine, on the north side of Little Broad River about 3 miles from Oglesby on the Seaboard Air Line Railway. Beryl of better quality, suitable for gems, was obtained from several shallow pits in the neighborhood.

MAINE.

Good beryl of gem quality was obtained by Mr. F. H. Peterson, of Fryeburg, Me. Three crystals—8 by 14, 5½ by 14, and 6 by 22 inches—considerably flawed, yielded some gem material. A smaller crystal, several inches long and ⅜-inch thick yielded some good aquamarine. The market for aquamarine is said to have been good.

MASSACHUSETTS.

The Reynolds mine at Beryl Hill, near Royalston, Mass., was again worked by Mr. F. H. Reynolds, of Boston, who obtained a large quantity of aquamarine beryl, of good color and clearness. Some of the material of fine quality yielded cut stones nearly 16 carats in weight. Many fine cabinet specimens were also obtained. The occurrence was described in detail in the report on precious stones in Mineral Resources for 1913. A lot of matrix specimens kindly loaned by Mr. Reynolds showed most of the beryl crystals embedded in a light smoky-gray granular quartz. Other minerals noted were a dark reddish-brown garnet, white feldspar, and mica plates. One small beryl crystal, not of gem quality, was embedded in feldspar. Among the cut stones also submitted by Mr. Reynolds were some very fine ones, of marked brilliancy and beauty of color. A large

table-cut stone of 15.7 carats, measuring 16 by 13 millimeters, was of an exceptionally fine blue color. Another large stone, measuring 18 by 14 millimeters, weighed 14.2 carats. A smaller table-cut stone, 14 by 11 millimeters, weighing 10 carats, was of an exquisite pale-blue color. A large round cut stone, measuring 14 millimeters across and weighing 12.6 carats, was very brilliant and of fine color.

NORTH CAROLINA.

A beautiful beryl weighing 3 pounds and containing good gem material is reported by Mr. L. A. Gettys, of Shelby, N. C., to have been found in Burke County.

SOUTH CAROLINA.

About 10 pounds of pale blue beryl were obtained by Mr. J. M. McConnell, of Anderson, S. C., from a deposit 3 miles from Anderson. The broken crystals were found on the surface and yielded some cut gems.

CORUNDUM (SAPPHIRE).

Mr. J. M. Robertson, of Bozeman, Mont., reports that an oriental amethyst, as the purple sapphires are called, was found on a bar of Missouri River a few miles from Helena, Mont. When cut the stone weighed 3½ carats. A green sapphire, or oriental emerald of a greenish-yellow color, clear and brilliant, 3 carats cut, was found with it.

The mines of the New Mine Sapphire Syndicate, of London, which are situated in Fergus County, Mont., were operated only to a very small extent and the output was less than in normal times. No new mining operations were reported, the various dumps being washed over.

DIAMOND.

ARKANSAS.

According to Kunz,[1] 32 stones were found by the watchman of the Arkansas Diamond Co. in 1915. These stones were white, yellowish, and brown. Three stones, transparent and perfect, weighed, respectively, 0.32, 1.22, and 2.50 carats. The total weight of the stones found was 17.9 carats.

The Kimberlite Diamond Mining & Washing Co. has been in constant operation, according to Austin Q. Millar, washing ground from the Mauney and the Ozark mines. It is the policy of this company to withhold figures of production, and the values given under the production of diamonds are therefore too small. As soon as the company is in a position to give figures of production, a more accurate statement of the value of the diamonds produced in this country can be given. The other companies in this field have not reported any production. A detailed report of the diamond-bearing area is in preparation by Hugh D. Miser, of the United States Geological Survey, who states that according to reports at least 4,000 stones have been produced up to July 1, 1916.

[1] Kunz, G. F., The production of precious stones for the year 1915: Mineral Industry, vol. 24, p. 608, 1916.

CALIFORNIA.

Isolated diamonds continue to be found in Cherokee Flat, Butte County. Placer miners washing for gold in the old diggings on ground owned by the United States Diamond Mining Co. found 9 stones in 1915, according to M. J. Cooney, manager of the Forbestown Consolidated Gold Mines, at Forbestown, Cal. Three of the stones averaged 1 carat each and were white and of first quality. The Cherokee ground owned by the United States Development Co. has been left open by the company for all comers to prospect. William Fliedner reports the respective weights of 2 stones found here to be eleven-sixteenths of a carat and one-fourth of a carat.

About 50 diamonds have been found in the Tertiary gravels of the old river channels in and about Smiths Flat, Eldorado County, and Burr Evans, of Placerville, Cal., has furnished a record of these diamonds. Judge W. P. Carpender, an old-time miner and justice of the peace at Placerville, who arrived there in 1854, kept an accurate record of all the diamonds found in Eldorado County, and from his list, supplemented by Mr. Evans's own contribution, the following notes have been taken. The weights given have been changed to metric carats.

In 1859 John Bradshaw found one small white stone in the Buchanan mine, Smiths Flat.

In 1865 John Lyford found one white stone weighing 0.97 metric carat at Smiths Flat, which was set rough in a ring.

In 1866 A. Brooks found one white flawed stone at Spanish Ravine which weighed 0.65 metric carat.

In 1867 Ward Bros. found three small stones near White Rock Canyon, the largest of which was valued at $50 in San Francisco.

In 1868 Thos. Ward & Co. found three stones in the Live Oak mine, Reservoir Hill, two white of medium size and one yellow. One, set in a ring is the possession of Mr. Ashcroft, of Oakland, Cal.

In 1868 Thomas Potts, sr., found near White Rock Canyon one light-yellow stone weighing 0.65 metric carat which was sold to A. W. Goodyear, first mineralogist of the State of California, when he visited the mines at Smiths Flat in 1871.

J. Jeffry found one yellow stone at Webber Hill, weighing 0.97 metric carat. No date given.

In 1868 Mrs. S. Henderson found one white stone of medium size in the Wisconsin Flat Mine.

In 1868 Cruson & Olmstead found four stones in the Wisconsin Flat mine.

In 1869 Henry Olmstead found one stone, $\frac{9}{32}$-inch maximum diameter, weighing 1.82 metric carats, with a white coating on the surface. It sold for $280 in San Francisco.

In 1870 McConnell & Reed found one canary-colored stone the size of a small white bean in a mine on the south side of Webber Hills and the east side of Texas Hill. Mrs. Caleb Reed, of Placerville, now has this stone set in a ring.

Nathaniel O. Ames found one stone weighing 1.30 metric carats in a mine on Webber Hill. No date given. It was set in a ring and worn by Shelly Inch, postmaster at Placerville, for many years. It is now in the possession of L. P. Inch, at 444 California Street, San Francisco.

Charles W. Schafer found one stone weighing 0.81 metric carat in the Tolkey mine, Texas Hill, which was sold to John Cook. No date given.

In 1878 Frederick Bendfeldt, sr., found one canary-colored stone weighing 0.45 metric carat at Smiths Flat, which was sold to W. F. Alma, of Boston.

In 1879 Edward Randall found one white stone in the Wisconsin Flat mine, which weighed 0.13 metric carat.

In 1894 Frederick Bendfeldt, jr., found one stone weighing 0.96 metric carat, canary color, which was sold to W. F. Alma.

In 1896 Bert Carpender found two white stones weighing, respectively, 1.92 metric carats and 0.26 metric carat; also one canary-colored stone weighing 1.67 metric carats. They were sold to W. F. Alma.

In 1896 Thomas Murdock found one yellow stone weighing 1.07 metric carats at Smiths Flat, which was sold to W. F. Alma.

In 1897 Snow Bros. found one white stone weighing 1.54 metric carats near Newtown.

In 1897 Snow Bros. found one canary-colored stone weighing 0.97 metric carat near Fairplay. It is now in the possession of George Richardson of Placerville.

In 1899 Bert Carpender found one white stone weighing 0.65 metric carat in the Stanley mine, Smiths Flat. It is now in the possession of W. P. Stanley.

In 1900 Frederick Bosworth found one white stone weighing 1.46 metric carats, in Cedar Ravine, at Placerville. Bosworth, of Placerville, still has this stone in the rough and has been offered $80 for it.

In 1901 J. Allen found one white stone in Cedar Ravine, at Placerville, weighing 0.42 metric carat, which was sold to W. F. Alma.

In 1912 Bert Carpender found one white stone weighing 0.97 metric carat, in the Carpender mine, at Prospect Flat.

About 1874 two diamonds were found at Smiths Flat, one weighing 0.10 metric carat, which was purchased by F. F. Barss from a Chinaman, and the other weighing 0.13 metric carat, which was bought by Mr. Barss from a white miner. Mr. Barss is quoted as saying that in the seventies and eighties he mounted five stones in breastpins and two in finger rings for different people, all of which were good diamonds and were found in the vicinity of Smiths Flat. Mr. Barss states that another good stone was found by Henry Ashcroft in 1869.

N. H. Burger says he cut and set in finger rings from 1906 to 1910 five diamonds that were found by different persons in the gravel of the Neocene river channels between Placerville and Smiths Flat. The stones ranged from 0.1 to 1 metric carat, and one was a fine stone of about 0.36 metric carat. About the year 1913 he set in a finger ring for Frank Jones a diamond of about one-half carat, which Jones had found in his gravel in Chile Ravine, just south of Placerville.

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FELDSPAR.

CALIFORNIA.

Mr. Joseph Ward, of Lone Pine, Cal., has sent additional specimens of amazon stone from the Death Valley region of California to the Survey. Some of the smaller pieces show a good color, and it is possible that further exploitation will show larger and deeper-colored material.

Microcline with interlaminated albite (perthite) is found in considerable quantity in the gem mines of San Diego County. The possibilities of cutting this material into cabochon stones, so oriented as to show the albite lamellae to the best advantage, do not seem to have been fully developed.

COLORADO.

The bulk of the feldspar, used as a precious stone, was produced by Colorado, the amazon stone leading all the other feldspars in value. Some gem orthoclase and oligoclase were also produced.

NEW YORK.

Mr. W. G. Levison, of Brooklyn, N. Y., reports that peristerite was found at Valhalla, N. Y., in one of the gneiss quarries from which some of the stone used in building the Kensico dam is obtained. The material seems to form part of a dike, and some of it shows on certain surfaces a beautiful blue sheen by reflected light. Several dozen stones have been cut.

UTAH.

A new find of transparent pale-yellow labradorite is reported by Kunz.[1] The locality is given as Millard County, Utah. The material is said to be similar to that found in the Altar Mountains of Arizona, described in this report for 1914.

GARNET.

ALASKA.

The Alaska Garnet Mining & Manufacturing Co., of Minneapolis, Minn., worked the deposit of garnets near Wrangell, at the mouth of Stikine River. The garnets are thickly distributed through the mica schist, 15 to 25 garnet crystals being often found on a square foot of rock. The largest garnets weigh half a pound. Although the surface stones are badly flawed, gems of fine color and quality are obtained by deep mining. Many were cut in cabochon shapes and a large number of such stones as well as specimens of garnet in the matrix were sold at the San Francisco Exposition.

[1] Kunz, G. F., The production of precious stones for the year 1915: Mineral Industry, vol. 24, p. 611, 1916.

IDAHO.

A few garnets were sent to Maynard Bixby, of Salt Lake City, Utah, for cutting. The garnets are reported to have come from a locality near Orofino, Nez Perce County, Idaho. The general appearance of the stones suggests spessartite. The garnet pebbles show rounded crystal faces, an unusual feature of garnet pebbles.

MASSACHUSETTS.

Some deep, rich red garnets, about 50 in all, were picked up on the surface of a micaceous schist rock in the Connecticut Valley in northern Massachusetts, not far from the Vermont line. Mr. S. W. Denton, of Boston, Mass., has cut from them perfect gems of 2 carats and larger ones slightly flawed. Apparently no development work has been undertaken.

OTHER STATES.

In addition to the States listed, an appreciable production of garnet was reported from Arizona, Montana, Colorado, California, Arkansas, and North Carolina. Several States not named have probably had a small production of gem garnets whose report has failed to reach the Geological Survey.

OPAL.

Mr. J. B. Kiernan, of Beatty, Nev., reports that massive opal is found in a deposit of diatomaceous earth, the variously colored opals being called by him vermilion (opal impregnated with cinnabar), amber (resinous opal), milky, and radio (smoky color due to organic matter). Some of this opal has been cut and sold.

QUARTZ.

PRODUCTION OF VARIETIES.

A large number of gem stones are varieties of quartz. The crystallized quartz includes amethyst, asteriated or star quartz, aventurine, cat's eye, citrine, dumortierite in quartz, goethite in quartz, gold-quartz, hornblende, actinolite and asbestos in quartz, milky quartz, rock crystal, rose quartz, rutile in quartz, sapphirine-quartz, smoky quartz, and Thetis hairstone.

Under the heading agate are included the compact, dense, granular varieties of quartz that are more or less translucent. The varieties include agate, agatized wood, carnelian, chalcedony, chrysoprase, moss agate, onyx, plasma, prase, rainbow agate, sardonyx, and violite.

Under the heading jasper are included the opaque, dense forms of silica, usually strongly colored by compounds of iron. Their value is largely dependent on the intensity, purity, and arrangement of the colors. The varieties are agate jasper, bloodstone, common jasper, jasperized wood, flint, novaculite, and touchstone.

Value of quartz gems produced in 1915.

Crystallized quartz (including amethyst and rose quartz)	$2,909
Agate (including chrysoprase)	24,312
Jasper	8,503
	35,724

The value of all the agate gems amounts to about two-thirds of the total value of all quartz or silica gem stones.

AMETHYST.

Amethyst of a good purple color was obtained by J. A. Scoggins, of Deweyrose, Ga., from a prospect near the Antioch mine. A. J. Rudinger, of Trevilians, Va., continued his prospecting in 1915 and after locating the vein took out a large number of crystals, a few of which would yield small gems of a rich purple color. Colorado, North Carolina, and Arkansas reported a production. Some amethyst of gem quality is occasionally found in the trap quarries of New Jersey.

SMOKY QUARTZ.

Associated with the topaz pockets developed by F. H. Peterson, of Fryeburg, Maine, was a quantity of smoky quartz which lined the sides of the pockets. The quartz crystals were of a beautiful dark amber color and about half of them were of gem quality and were cut into different shapes. A production of smoky quartz is also reported from Colorado, California, Arkansas, Arizona, Connecticut, and New Hampshire.

MINERALS INCLOSED IN QUARTZ.

Transparent quartz crystals with included goethite needles were mined near Bakersville, N. C., by W. G. Bowman. The hairlike needles of goethite give a rainbow hue to the specimens. Mr. Maynard Bixby, of Salt Lake City, Utah, reports that a deposit of tourmalinated quartz was found in Nevada, the exact locality not being given. Mr. Roy Carson, of Pasadena, Cal., reports a small production of tourmalinated quartz from the Panama-Pacific Exposition group of three claims on the east side of Chihuahua Valley, San Diego County. Asteriated quartz, gold quartz, and rutilated quartz are additional varieties of quartz inclosing minerals that were produced in 1915.

AGATE.

CALIFORNIA.

An amethystine or violet-colored chalcedony, found east of San Diego, has been put on the local market under the name violite. A specimen of the material was on exhibition in the San Diego Chamber of Commerce during the summer of 1915. The rough material resembles violet-colored chalcedony from other localities, and the cabochon-cut stones can not be told from cloudy amethysts. California continued to produce carnelian, blue, white, and variously colored chalcedony, myrickite, and chrysoprase.

KANSAS.

Various kinds of agate and chalcedony are found in the gravel beds of the Big Blue River and its branches, on the hillsides near the river in drift, and also on the high prairie. A small production is reported by Mr. Samuel Forter, of Marysville, Kans.

MONTANA.

Considerable quantities of moss agate, mocha stone, and various other agates were found in eastern Montana in the gravel beds along Yellowstone River. The moss agate is found in irregular pieces from 1 ounce to 10 pounds in weight, each piece being individually valued according to its peculiar markings. A set of cut and polished moss agates was sent to the Survey by the Hanson-Kohn Jewelry Co. (now the Kohn Jewelry Co.), of Billings, Mont. Among the best of these were 12 stones, as follows:

1. Size, 21 by 11 millimeters. Resembles a landscape with a few scattered trees; rolling ground, with small hills. Highly translucent chalcedony; brownish-black markings. Mounted as brooch in gold.
2. Size, 28 by 15 millimeters. Looks like woods along shore of river or lake—brush and trees 1–5 millimeters high in perfect likenesses; some in distance. Agate, highly translucent, slightly banded with bluish-gray and brownish-black markings.
3. Size, 32 by 21 millimeters. Shows a landscape with a grove of tall trees like Lombardy poplars; high on right, low like edge of clearing on left. Trees in haze in distance. Brush from 1 millimeter to trees 10 millimeters high; ground line under trees sharp, with some brush. Bluish-gray, slightly banded chalcedony; the trees black; ground brownish black to black.
4. Size, 48 by 21 millimeters. Resembles thicket of small brush and woods, passing into brushy and grassy slope to shore of river or lake on right. Bunch of leaves or tree branches overhanging water on right. Tallest trees, 8 millimeters. Trees in distant haze. Black and brownish markings in highly translucent bluish-gray chalcedony, showing faint bands.
5. Size, 42 by 32 millimeters. Shows brownish-black buffalo head; 28 millimeters sweep across horns, 20 millimeters high; not perfect but easily recognizable. Mounted as fob stone.
6. Size, 50 by 20 millimeters. Two hills, slopes covered with brush of uniform height, 1½ millimeters high. Gully between hills nearly bare of brush. Two small bunches of tree branches overhanging from right corner. Other branches in haze in distance in back. Sky otherwise clear. All markings brown on translucent, bluish-gray chalcedony. No banding.
7. Size, 33 by 20 millimeters. Shows resemblance to sand dune with wide spreading tree on top. Tops of trees appear over hill. Dark-brown color on translucent bluish-gray chalcedony. No banding.
8. Size, 26 by 13 millimeters. Group of ferns, about seven distinct plants, 7–10 millimeter high and 2–3 millimeters wide. Several varieties of structure, evenly arranged. Black to dark brown on translucent bluish-gray chalcedony. No banding.
9. Size, 34 by 19 millimeters. Group of black to dark-brown radiating fern leaves in clear, transparent, light bluish-gray chalcedony. No banding. Three main arms of fern 120° apart, with smaller leaves in between.
10. Size, 33 by 16 millimeters. Resembles a water scene, with clear bluish-gray sky. The water edge marked by wide curving brownish band, with several groups of black trees showing reflection in water. Two small patches of sedge in foreground. Transparent, bluish-gray chalcedony. No banding.
11. Size, 43 by 22 millimeters. "Lonesome pine." A single pine tree, the lower part of trunk clear, the upper brushy and spreading into three distinct layers, black, against faintly banded translucent, bluish-gray chalcedony. The faint banding gives a good cloud effect. Foreground, clear, brown, also faintly banded. A small irregularly shaped dark-brown flaw, to the left and slightly above horizon, somewhat mars an otherwise perfect picture.
12. Size, 32 by 24 millimeters. Water scene. Group of islands, with trees, black to dark brown, the largest 7 millimeters high and 5 millimeters wide. Many small

islands. In foreground, nearly continuous curved line of small islands, with practically no vegetation higher than sedge grass. Translucent bluish-gray chalcedony. Faintly banded.

NEBRASKA.

Moss agate is found in considerable abundance in northwestern Nebraska.[1] Chalcedony is also found in concretionary and stalactitic form, of a waxy or oily luster and of a yellow color. Some of it has been cut and sold in southeastern Nebraska.

OREGON.

Various agates are found as stream pebbles in Rogue River valley near Medford, in basaltic lava areas—black and brown moss agate, jasper, carnelian, etc. A banded jasper, a clear stone with a small red band shading off into yellow, jasper has been found at Tillamook, near Newport.

JASPER.

ARIZONA.

A variety of agate jasper occurring in irrgeular nodular forms near the rim of the Grand Canyon, Ariz., about 1 mile west of El Tovar Hotel, has been called zonite by S. W. Denton, of Boston, Mass. The name is apparently derived from the State in which it is found and not because of any zonal structure in the material. The material cut in cabochon form has been used by arts and crafts workers. The colors are white, cream, pink, yellow, brown, and plum. The material is hard, close-grained, uniform in texture, and takes a high polish. Samples sent to the Survey in both the rough and the cut forms show a compact chert in which many of the color variations are marked and abrupt, with consequent pleasing color patterns on the polished stone. Most of the colors are in the yellows, brownish reds, and dark grays, with splotches of white and light gray.

Mr. E. A. Howard, of Cave Creek, Ariz., sent in some samples of a red jasper which polishes well and no doubt would make an interesting and handsome semiprecious gem. The material contains numerous concentric rings of specular hematite. Mr. Howard intends to place the material on the Los Angeles market. The material occurs in a small streak in an irregular mass of variously colored jasper, which is found in a large basaltic intrusion in schist. The wavy circular lines of the concentric bands average about a quarter of an inch in diameter. These concentric bands occur isolated and also joined together in small groups. The black lines, due to a concentration of black hematite grains set in a strong hematite-red, make a pretty contrast and if cut with reference to the black circles should make odd and attractive gems.

OTHER STATES.

A large production of kinradite from California is reported. This new gem stone, consisting of small spherulites set in a dense base, is fully described in the report on precious stones in Mineral Resources for 1913. Colorado, Arkansas, Nevada, and North Carolina also report a production of jasper, the varieties including bloodstone, Lydian stone, novaculite, and agatized and petrified wood.

[1] Barbour, E. H., Nebraska minerals which excite common inquiry: Nebraska Geol. Survey Leaflet 37, vol. 4, pt. 20, p. 269 (no date).

RHODONITE.

OREGON.

A vein of rhodonite 4 feet wide is reported by Mr. D. B. Bubar, of Roseburg, Oreg., to have been found near the caves on Caves Creek, Josephine County. Preliminary work showed considerable material available and slabs 6 by 8 inches could be obtained. The rhodonite is said to be of good quality and to take a fine polish.

STAUROLITE.

MINNESOTA.

Mr. T. C. Wing, of St. Cloud, Minn., has sent in samples of staurolite from the banks of the Mississippi about 25 miles north of St. Cloud and about 3 miles from Royalton. Many of the crystals are twinned so as to form the usual crosses, but perfect ones are not common. The crystals, as much as an inch in length, are found loose in the soil, in a blue clay, and also in the schist matrix. Bowlders 3 feet thick contain numbers of the crystals. The mineral is dark brown and unaltered, and therefore too hard to be finished off smoothly for the jewelry trade like the similar stones from Virginia.

VIRGINIA.

The staurolites, better known as "fairy stones," are found in a field of about 50 acres on top of Bull Mountain, Patrick County, and have a ready sale. These "fairy" or "lucky" stones are twinned staurolite crystals simulating the Roman, Maltese, and St. Andrew's crosses. They are as much as an inch in length and are of a dark-brown color. The original staurolite mineral has changed to a compact softer material, so that the stones can readily be prepared for the jewelry trade. A brisk trade in these popular stones is reported; they are mounted as cuff links, scarfpins, brooches, charms, and in many other ways.

THOMSONITE.

An occurrence of thomsonite in an amygdaloidal rock in Cook County, Minn., about 7 miles from Grand Marais, has been worked by Alfred Merritt, of Duluth, Minn. A number of stones of gem quality are said to have been obtained, and Mr. Merritt intends soon to mine and market the stones. The colors vary from a light yellow or brown to a dark green, with many intermediate shades. Those stones which are cut so as to show a central eye are in good demand, being used for settings in scarfpins, cuff links, brooches, etc.

The mineral is also reported from Lane County, Oreg., in a road cut 100 yards west of Deerhorn; also in the gravel of Willamette and McKenzie Rivers, near Eugene.

TOPAZ.

Mr. H. C. Gordon, of San Diego, Cal., reports that about 30 crystals of bluish topaz, some of them containing gem material, were taken from the Mountain Lily mine, near Oak Grove, San Diego County.

Several pockets of topaz crystals were opened by F. H. Peterson, of Fryeburg, Maine. The topaz was scattered through the black dirt in

the bottom of the pocket. In addition to California and Maine, Colorado and Texas reported a small output of topaz.

TOURMALINE.

CALIFORNIA.

Bluish-green tourmaline, of a color called Nile green, was produced from the Mountain Lily mine near Oak Grove, San Diego County. These tourmalines have been given the trade name of emeralite by J. W. Ware, of San Diego. The Peter Cabat mine, about 6 miles north of Warners, Hot Springs, has produced some good blue and light-pink tourmalines. In a newly developed mine south of Banner, San Diego County, Bert Simmons, of Oak Grove, has obtained green tourmalines of gem quality. Some green crystals of good color and gem value, together with some deep blue ones, were obtained by Roy Carson, of Pasadena, from the Panama-Pacific Exposition group of three claims on the east side of Chihuahua Valley, San Diego County.

MAINE.

Fine pink and green tourmalines were found near Georgetown. The Mount Apatite mines, near Auburn, and deposits at Paris have yielded some tourmaline and beryl.

TURQUOISE.

Turquoise ranks third in the value of precious stones produced in 1915, tourmaline being very nearly of equal value. Nevada, New Mexico, and Arizona produced the bulk of the turquoise.

A new deposit of turquoise was discovered in the fall of 1915 by J. H. Malloy, of Rawhide, Nev. The locality is reported as being near Rand, about 18 miles south of Rawhide.

VESUVIANITE (CALIFORNITE).

A small quantity of californite was extracted from the deposits at Big Bar, Butte County, Cal. The color and quality are steadily increasing as the workings descend from the surface, the material becoming dark green with darker green spots. A production was also reported from Happy Camp, Siskiyou County.

ZOISITE (THULITE).

Mr. A. C. Taylor, of Seattle, Wash., reports that a ledge in Okanogan County contains a large amount of rose-red stone pronounced to be thulite, a variety of the mineral zoisite. The deposit is apparently to be worked by the Thulite Association Claims, 427 L. C. Smith Building, Seattle, Wash.

IMPORTS.

The value of the imports of precious stones into the United States during the calendar year 1915 as reported by the Bureau of Foreign and Domestic Commerce, amounted to $26,193,862, an increase of $6,982,778 over 1914, which was the smallest since 1908.

Diamonds and other precious stones imported and entered for consumption in the United States, 1906–1915.

Year.	Diamonds.					Diamonds, and other stones not set.	Pearls.	Total.
	Glaziers.	Dust or bort.	Rough or uncut.	Set.	Unset.			
1906	$104,407	$150,872	$11,676,529	$305	$25,268,917	$3,995,865	$2,405,581	$43,602,476
1907	410,524	199,919	8,311,912	.....	18,998,336	3,365,902	680,006	31,866,599
1908	650,713	180,222	1,636,798	.....	9,270,225	[a] 1,051,747	910,699	13,700,404
1909	758,865	50,265	8,471,192	.....	27,361,799	[a] 3,570,540	24,848	40,237,509
1910	213,701	54,701	9,212,378	.....	25,593,641	4,003,976	1,626,083	40,704,487
1911	199,930	110,434	9,654,219	.....	25,676,302	3,795,175	1,384,376	40,820,430
1912	452,810	94,396	9,414,514	.....	22,865,686	3,405,543	5,130,376	41,363,325
1913	471,712	100,704	12,268,543	.....	24,812,604	2,775,811	5,002,624	45,431,998
1914	579,332	77,408	2,851,933	.....	11,976,871	1,635,522	2,090,018	19,211,084
1915	366,793	75,944	7,020,646	.....	13,169,998	1,046,572	4,513,909	26,193,862

[a] Including agates. Agates in 1906, $20,130; in 1907, $22,644.

FOREIGN GEM INDUSTRY.

The foreign governmental regulations, trade conditions, market, imports, and production in regard to diamonds, resulting from the European war, are described in detail by Kunz,[1] who also gives notes on emerald and deep-blue beryl from Brazil, jade from Burma, opal (said to be noble opal) from South Australia, sapphire from Queensland, and turquoise from Lower California. The sapphire-mining industry of Anakie, Queensland, is said [2] to have been the dullest on record, the output for 1915 being £600, compared with £15,000 in 1914 and £43,292 in 1913.

The diamond output of British Guiana for 1915 was 100,522 stones, weighing 13,716½ carats and valued at £28,576. The stones averaged 7.32 to a carat.

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