

Gems & Gemology

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Robert M. Shipley, Editor

VOLUME V

SUMMER, 1946

NUMBER 6

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Published by

THE GEMOLOGICAL INSTITUTE OF AMERICA
(UNITED STATES AND CANADA)

541 South Alexandria Ave.



Los Angeles 5, California

Gemstone Inclusions

by

EDWARD GÜBELIN, Ph.D., C.G.

These illustrations conclude a specially selected series of inclusions in gemstones from Dr. Gübelin's Kodochrome-and-lecture gift to the Institute.

Presented as an aid in identifying gem species, the photomicrographs in this issue show inclusions in emerald, chrysolite, quartz, garnet and moldavite.

This series commenced in the Summer, 1944 issue, and carried through Spring, 1945. The current series was begun again in the Spring, 1946 issue.

All the studies were made by Dr. Gübelin of Lucerne, Switzerland, G.I.A.'s only graduate so far to earn its Research Membership. A photograph of his well-equipped laboratory also appears in this issue.

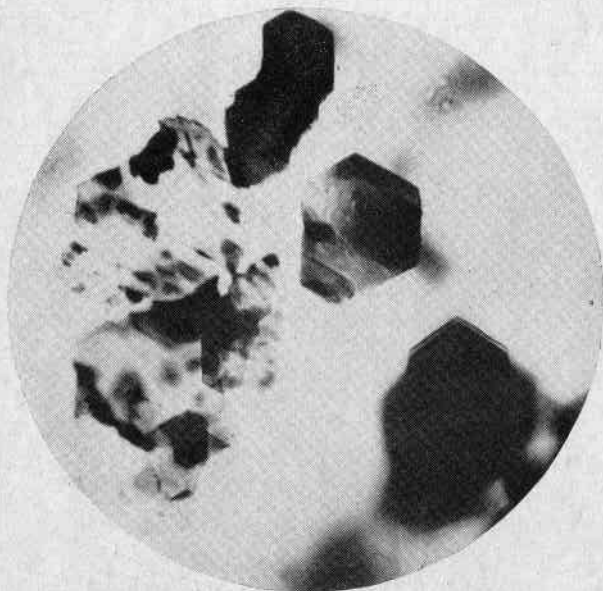


Photo by Dr. Gübelin

*Figure 62
Tablets (flake-like
crystals) of brown
biotite in African
chrysolite.*

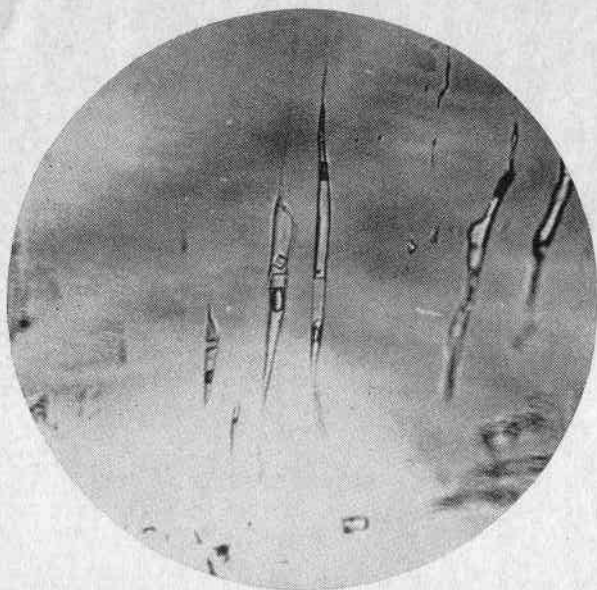


Photo by Dr. Gübelin

Figure 63
Long stretched
three-phase inclu-
sions as are typical
of natural emerald.

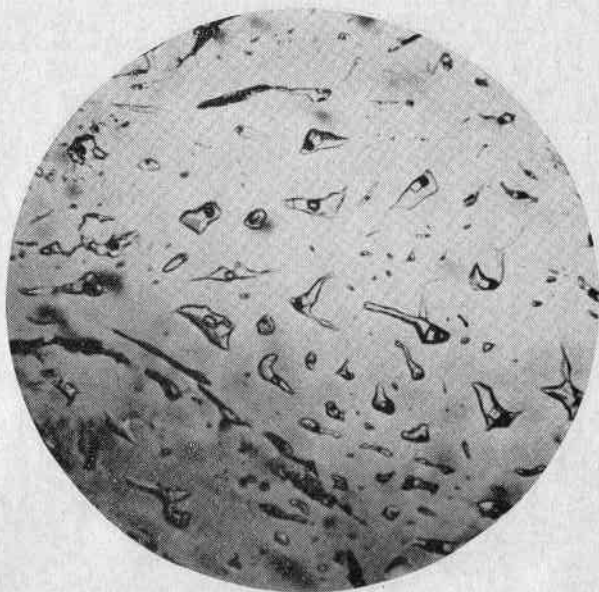


Photo by Dr. Gübelin

Figure 64
Smallest three-phase
inclusions in Colum-
bian emeralds.

Photo by Dr. Gübelin

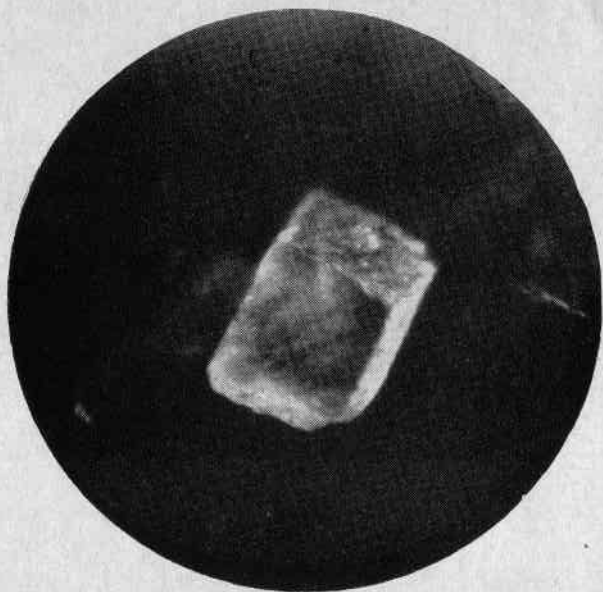


Figure 65
A large inclusion of iceland spar (calcite) in a Colombian emerald.



Photo by Dr. Gübelin

Figure 66
An unusual group of well-developed pyrite crystals in a Colombian emerald.



Photo by Dr. Gübelin

Figure 67
Long fiber-like crystals of actinolite in quartz.

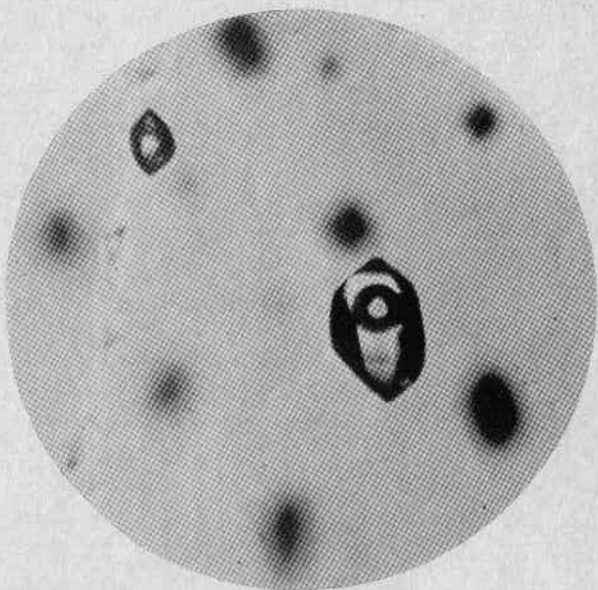


Photo by Dr. Gübelin

Figure 68
Excellent phantom containing liquid and a moving bubble. An inclusion in a light yellow citrine. The characteristic prismatic habit of quartz is beautifully reproduced in this negative crystal.

Photo by Dr. Gübelin

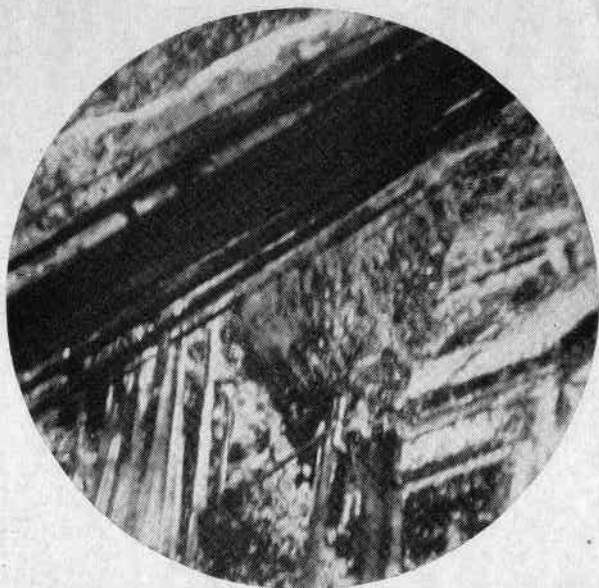


Figure 69
Bundles of long brown rutile needles (crystals) in rock crystal.

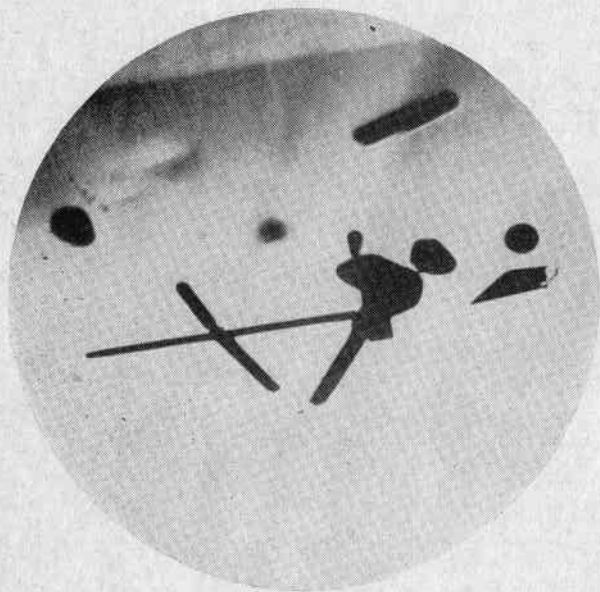


Photo by Dr. Gübelin

Figure 70
Long prismatic crystals and irregular grains of hornblende in garnet.

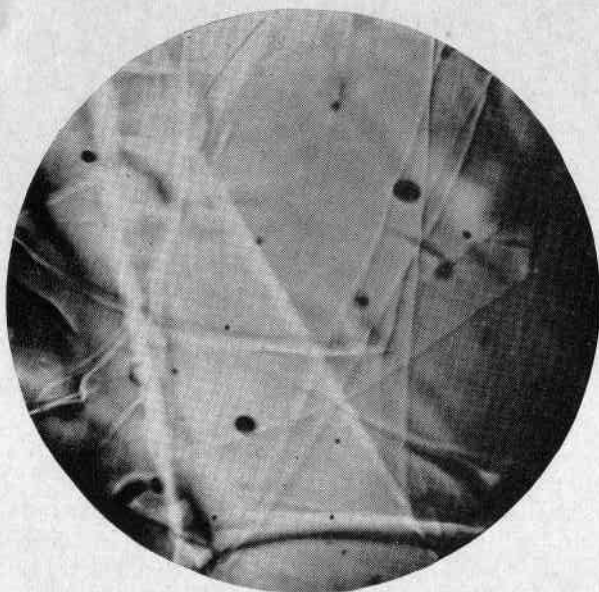


Photo by Dr. Gübelin

Figure 71
Minute gas bubbles and characteristic softly furrowed streak in a moldavite (a natural glass).

Another of Dr. Wigglesworth's Generous Services Revealed

Dr. Charles Palache's sincere "Memorial of Dr. Wigglesworth," in the March-April issue of *The American Mineralogist*, reveals that in developing the outstanding New England minerals collection of the New England Museum of Natural History during his twenty-one-year-old directorship, Edward Wigglesworth purchased several collections with his private means.

Almost simultaneously a short note appeared in the May issue of *The Mineralogist* (Portland, Oregon) that after operating for eighty-three years, the New England Museum of Natural History had packed and stored its collections and closed its doors. Present outmoded property and housing facilities are to be sold, and construction on a new site is planned.

The Leveridge Millimeter Gauge And Weight Estimator

By THERESE LEVERIDGE

(A. D. Leveridge, New York)

Spurred by the need for better and quicker means of measurement of the popular Baguettes, Squares and fancy shaped diamonds in which we were specializing, and inspired also by the movement of the Gemological Institute of America toward greater accuracy in the jewelry trade, our firm in 1926 brought out the first clock-dial gauge for diamonds, for use by jewelers and dealers in precious stones. Various improvements followed, until in 1938, the device which is now in demand the world over, known as the New A. D. Leveridge Millimeter Gauge & Weight Estimator, was manufactured in Switzerland and placed on the market.

Through this newer instrument we met the demand of diamond customers and the entire jewelry trade for better means of estimating the weights of mounted precious stones of all kinds, and at the same time offering an improvement on the method of measurement by tenths of millimeters. Estimates of diamonds were effected with ease and with much greater precision than was possible with the gauge of caliper type. This accuracy was due principally to new tables which we had calculated, based on our own research and aided by valuable technical information received from Mr. Raymond Mehrlust and Mr. Gaston Marchand, as well as records of weights and measurements supplied by many prominent retail jewelers. The sum total of this experience

resulted in reduction of miscalculations by tradesmen in their weight estimation of mounted stones. With the new instrument, errors of as much as ten per cent are now a rarity even on emerald cuts. Formerly errors in calculation ran as high as thirty per cent on fancies, and losses on one stone frequently meant a loss on the purchase and sale of an entire estate.

At the outbreak of World War II, the stocks of the Leveridge Gauge-Estimator were depleted, but the demand could not be satisfied by manufacturing in either America or Switzerland for obvious reasons. In the fall of 1945, when we were preparing to resume foreign manufacture of the Gauge (to include certain improvements), Mr. Robert M. Shipley, Executive Director of the Gemological Institute of America, advised us that the line of instruments marketed by the Institute for progressive jewelers and dealers in precious stones, had achieved such popularity that it might be expanded. Since there was a steady demand for an estimating device, the Institute was interested in manufacturing and marketing a Leveridge Gauge and Estimator in this country, rather than develop one independently. With the collaboration, therefore, of the Gemological Institute of America and with the inclusion of certain improvements to those we had in mind, an American series was designed and is being

(Continued on Page 328)

An Analysis of Recent Hematite Substitutes

by

KENNETH G. MAPPIN, C. G., F.G.A.

Four different samples of materials in current use as substitutes for hematite have been examined and analyzed chemically in an attempt to determine their nature.

Sample 1 had a steel-grey color with a brownish tint when viewed from certain directions and a metallic lustre on fresh surfaces. It had a yellowish-brown (rather weak) streak and a hardness of about 5.5. It was brittle and infusible. Its specific gravity was approximately 4.

Chemical, spectroscopic and X-ray diffraction analyses were run on the sample. By qualitative analysis, titanium, copper, chromium and cobalt were found to be present. This was confirmed by a spectroscopic analysis which indicated titanium as the principal constituent. The X-ray diffraction photograph showed that the main constituent was titanium dioxide in the form of rutile. Quantitative chemical analysis showed close to 90 per cent rutile. Absence of iron indicated that the rutile was probably synthetically derived.

Samples 2 and 3 which were cut as intaglios were steel-grey in color with metallic lustre. They had a hardness of only about 2.5 to 3, a black streak, and were brittle and easily fusible. Their specific gravity was between 6.5 and 7, an average of about 6.85. They were analyzed in the same manner as was Specimen 1.

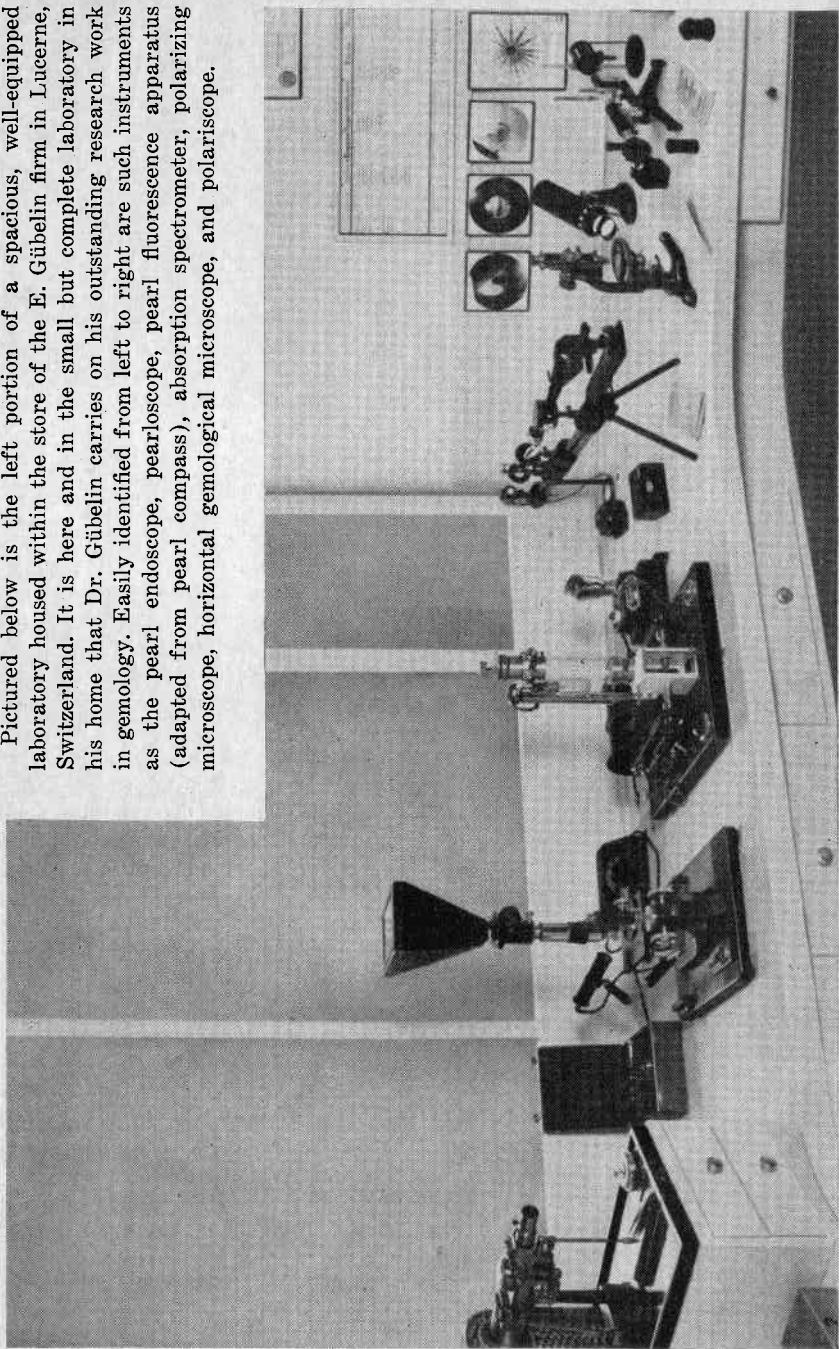
Except for slightly more iron in *Sample 3*, the results on that sample were almost identical with that of the results from *Sample 2*, and showed that the principal constituents were lead, copper and silver in each case. The X-ray powder diffraction photograph showed that galena (lead sulphide) was the major constituent of each sample. Few relatively weak powder diffraction rings of undetermined origin probably are either due to lead sulphate or cuprous sulphide. Both samples have probably been made from powdered lead sulphide, because they show no evidence of natural galena's cubic cleavage. Their easy fusibility suggests that they are made by mixing in the molten state and are poured into molds. If the powdered sulphide is made from natural galena, a small amount of silver may have been introduced through this source.

Samples 2 and 3 are inferior to *Sample 1* as a substitute for hematite, because of their softness and vulnerability to heat and acids.

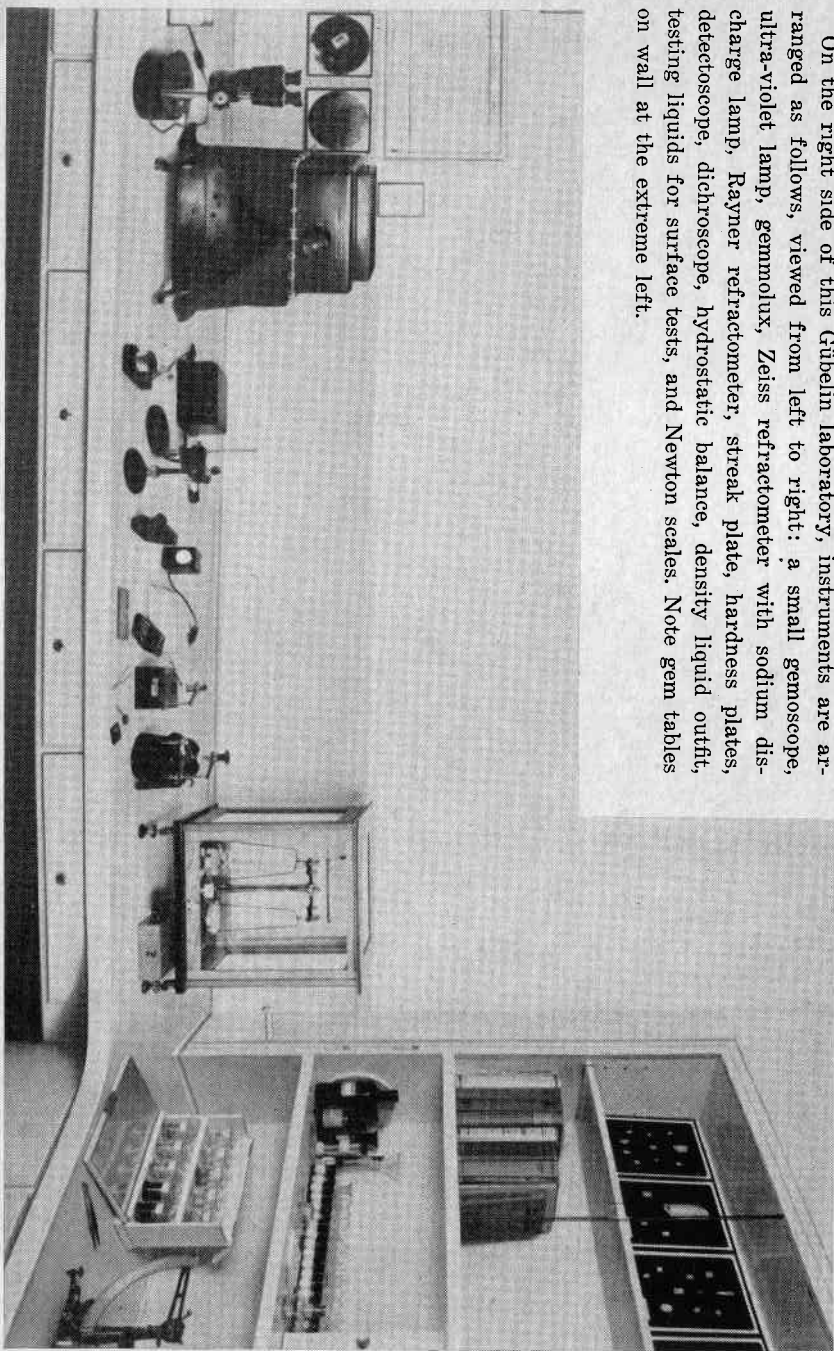
Sample 4 proved definitely superior to any of the other three. It was also an intaglio, showing the customary gladiator's head. The color was also steel-grey, but not as dark as 2 and 3. It had a metallic lustre, a reddish-brown streak and a hardness of about 6. Specific gravity was 4.84. Methods similar to those used on the other samples showed iron

(Continued on Page 328)

Pictured below is the left portion of a spacious, well-equipped laboratory housed within the store of the E. Gübelin firm in Lucerne, Switzerland. It is here and in the small but complete laboratory in his home that Dr. Gübelin carries on his outstanding research work in gemology. Easily identified from left to right are such instruments as the pearl endoscope, pearloscope, pearl fluorescence apparatus (adapted from pearl compass), absorption spectrometer, polarizing microscope, horizontal gemological microscope, and polariscope.



On the right side of this Gubelin laboratory, instruments are arranged as follows, viewed from left to right: a small gemoscope, ultra-violet lamp, gemmoluX, Zeiss refractometer with sodium discharge lamp, Rayner refractometer, streak plate, hardness plates, detectoscope, dichroscope, hydrostatic balance, density liquid outfit, testing liquids for surface tests, and Newton scales. Note gem tables on wall at the extreme left.



Leveridge Gauge & Weight Estimator

(Continued from Page 324)

produced for the Gemological Institute of America in one of the leading American precision instrument laboratories.

The American series will also include the original World Copyrighted books of estimating tables, produced as formerly, on burnished celluloid in an attractive newly designed, genuine leather case. The pearl estimating tables, the rights to which had been originally licensed to A. D. Leveridge by Osterwald & Co., 608 5th Avenue, New York City, for use with this device, have been corrected

for even closer precision than in the earlier book. Again, Osterwald & Company have given their consent to the use of these tables with the Leveridge Gauge & Weight Estimator by the Gemological Institute of America.

The thirty-four page booklet of tables fits into the same vest pocket, zippered, leather case as the instrument. The booklet gives full directions for the use of the outfit and provides illustrations for this purpose, as well as pages of information to jewelers on melees, small fancies, and other useful data.

Hematite Substitutes

(Continued from Page 325)

and copper as the main metal constituents with titanium in appreciable quantities.

The X-ray diffraction analysis showed hematite as the principal substance present, but the quantitative analysis gave about 81.4 per cent ferric oxide and about 10 per cent titanium oxide.

On the basis of these two tests, Sample 4 consists of about 81 per cent hematite. It is, therefore, different and better than Samples 1, 2 and 3. It appears to be a synthetic product, either a solidified melt from

mixed oxides, or more probably, sintered.

A small reddish-brown spot on the back of the sample had the appearance of an occlusion in a solidified melt.

All four synthetic substitutes for hematite were apparently manufactured from powder and in no case had been completely made from powdered hematite. It would appear from this that the names by which all seek to imply that the materials are of a hematite nature are incorrect and falsify the true nature of the substitutes.

GEMOLOGICAL DIGESTS

Gemstones in 1945

*(Condensation of Article
by Sidney H. Ball, Ph.D.)*

Nineteen forty-five saw domestic production of gemstones at its lowest ebb in years, total output being about \$40,000. Various causes contributed to that situation: wartime restriction of labor, mining supplies, tires and gasoline. Near the end of the war, moreover, adequacy of strategic minerals reduced the necessity of mining pegmatite dikes from which gemstones were a by-product.

With the present availability of gas and other supplies, however, lapidaries are becoming more active, the West Coast now operating at least 50 shops, with the number increasing rapidly.

As a result of the low production of gem minerals, the value of jade for the first time exceeded that of sapphire and turquoise as the most important gem material produced in the U.S.A. Wyoming in 1945 produced a number of tons of light green nephrite, chiefly from the Lander region. Alaska jade appeared on the market from mines on the north side of the Kobuk River where there are several claims. Turquoise mining was carried on in Nevada, Colorado and Texas but not in New Mexico.

Diamond Imports for the Year

The total value of gemstone imports for consumption in the U.S.A. in 1945 totalled \$114,435,231. Of that amount, diamonds totalled \$43,000,000 for uncut, and \$64,000,000 cut

but unset; other genuine gems, approximately \$5,000,000.

Rough stones sales by the Diamond Trading Company reached an all-time peak of £24,500,000. With consumption exceeding production, the drain on stocks was so heavy that many grades of rough and cut gems were depleted and in no grade are they large. Consequently, both gem and industrial diamond trades must look more and more to current production for diamonds. Although additional mines are being equipped, no great increase in production can be expected for three or four years. Uncut gem diamonds are now quoted at more than twice prewar prices, although there has been no advance in wholesale prices of industrials in seven or eight years. In fact, industrials, once a drug on the market, now represent about 20% in dollar value, of the world's rough sales.

Imports of gem diamonds into the U.S.A. have increased from \$26,186,948 in 1942 to \$107,309,028 in 1945, a gain of almost 310 per cent. Belgian Congo was the leading producer by weight (73.2%), although it represented but 13 per cent of the value. On the other hand, the British Empire, while accounting for only 19.2 per cent of the weight, represented 71 per cent of the value.

A new gemstone of considerable beauty, brazilianite, was discovered during the year. Zincite (from Franklin Furnace, N.J.) of an attractive deep red color has recently been cut into gems. The aquamarine

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has become so popular a gemstone that blue topaz (a superior stone if fine in quality) is appearing on the market as a substitute. Price has moved up markedly, apparently to an unwarranted extent. Exports in aquamarine to the U.S.A. have increased considerably: in 1943, 158,695 carats valued at about \$232,000 (\$1.46 per carat), and in 1944, 364,285 carats valued at \$578,506 (\$1.58 per carat) were imported from Brazil.

Richard T. Liddicoat, C.G.

Reconstituted Turquoise

Recently an oval-cabochon-cut, turquoise-like material was submitted to the G.I.A. laboratory for identification, with the word that it was being sold in Southwest U.S.A. as "Reconstituted Turquoise." The material has a color similar to that of better quality

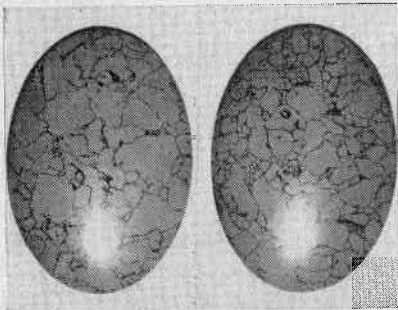


Photo by G.I.A.

turquoise, with spider-web-like network of dark brown matrix material evenly scattered throughout the surface. The distribution of the matrix may be seen in the accompanying photograph.

Qualitative chemical analysis

showed the presence of copper, aluminum and phosphate (the important constituents of turquoise), as well as a small amount of silica, also common in turquoise. An x-ray powder photograph, however, revealed conclusively that the material was not turquoise and was probably produced from the raw chemicals and bonded in either plastic or porcelain, in the size cabochon in which it appears. Microscopic examination disclosed tiny bright blue spots, like larger-than-average grains. Such blue spots are not found in genuine turquoise. Striking two of the cabochons together gives a sound characteristic of porcelain material. The hardness of the material is about 4, compared to turquoise hardness of 5 to 6.

The fact that the material is definitely not made from turquoise makes the name "Reconstituted Turquoise" a misnomer and thus should be avoided by the ethical jeweler.

Richard T. Liddicoat, C.G.

Ownership of the Sancy Verified

Shortly after Lady Astor's arrival for her recent visit in this country the N. W. Ayer Company inquired of her whether the report that she owns the Sancy diamond were true. Her reply was that her husband, Viscount Astor, owns the gem and that "it's large and very ugly."

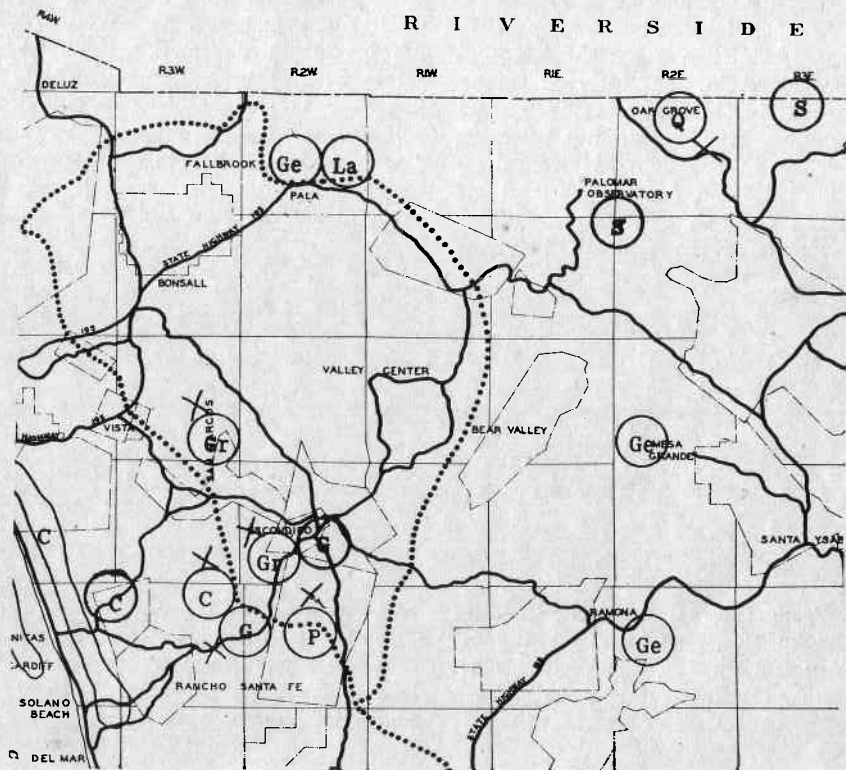
Verification of ownership of the Sancy will be incorporated in the story of this unusual gem which appears in Shipley's *Famous Diamonds of the World*.

Gemstones in San Diego County

The accompanying map, showing gemstone deposits in San Diego County, appeared in the April, 1946, issue of the Second Annual Report of the Division of Natural Resources of the San Diego County Department of Agriculture. The symbol "Ge" indicates location of mines.

and beryl were also produced near Ramona, and kunzite in the Pala region, in considerable quantities.

For several years, commercial production has been at a standstill and the areas are frequented by prospectors and amateur mineral collectors. While most of the easily accessible surface deposits of any size have been worked out, the Division of Natural Resources of the San



About the turn of the century, the volume of production and quality of San Diego County gemstones was known all over the world, tourmaline being particularly popular in China as a sacred stone. At that time topaz

Diego County Department of Agriculture intimated that through further exploration and working of these old mines and adjacent areas, a reasonable production might again be realized.

Alexander Evgenievich Fersman

Much has been written in recognition of the extensive activities of the distinguished Russian mineralogist and geochemist, Alexander Evgenievich Fersman, who died in the spring of 1945.

A specialist for twenty-five years in geochemistry of the U.S.S.R. and Central Asia, he received many honors in his own country and England. His outstanding scientific services in the field of mineralogy extended from exploration and research through education and prolific writing. In fact, in 1940 the

U.S.S.R. Academy of Sciences published a bibliography showing 679 entries of his writings in the period from 1904 to 1940.

During Fersman's authoritative work on pegmatites, he was led into studies of gemstones. As a result of his investigations in this field, he wrote several books, among which are four volumes which he edited jointly on the Romanoff crown jewels, and an elaborate work which he co-authored on the crystal morphology of the diamond.

GIFTS TO THE INSTITUTE

From George Marcher, C.G., of Los Angeles, one of the first students of gemology and one of the most active, the Institute has received a large collection of rough minerals

and gemstones. These unusual specimens will be invaluable in class and laboratory work in many ways, such as demonstrating properties of gems and little known gem species.

Two rough and four cut Montana sapphires, all excellent specimens, were recently presented to the Insti-

tute as a gift from John M. Friedlander, Registered Jeweler of Seattle, Washington.

BOOK REVIEW

Revised Lapidary Handbook, by J. Harry Howard,
Greenville, S.C., 1946, \$3.00

(May Be Obtained from G.I.A. Book Dept.)

While the 1936 edition of the *Lapidary Handbook* met a real need, being one of the first in the field, the new book is more far-reaching. It aims "to provide practical instruction in all kinds of gem cutting for the beginner and the advanced amateur" and does not place much emphasis therefore on speed or mass production.

Numerous illustrations amplify the comprehensive detail with which various processes are handled by the author. Occasionally as he outlines methods step by step, he states the purpose of each operation and cautions against pitfalls. Under "Scratches or Grain Marks" in the chapter on "Cutting Faceted Gems," he has made an outstanding attempt to master a problem that has tormented both commercial and amateur lapidists. For one who wishes to trace light through some of the gemstones, the chart on page 147 will save much figuring, but a line for diamonds would have been an interesting addition. In the chapter by C. G. Waite, the large variety of suggested facet arrangements provides an incentive to the amateur. While some of the designs might be rated by a commercial industry as "stunt cutting," they are part of the amateur's fun, and styles might be developed by amateurs that would prove worth while commercially.

A few more points of criticism: (1) Concerning the use of a culet (page 92), the reviewer believes that a culet is usually omitted from the diamond as unnecessary and somewhat distracting to the brilliancy, but other stones, more susceptible to injury in this vital spot, should have a culet; (2) while the highly dichroic tourmalines (dark green and brown) should be oriented with the table parallel to the crystal axis, the pink and other less dichroic members of the group need not be so oriented; (3) the reviewer's observation regarding amethyst crystals (or "points") is that they tend to have both the clearest part as well as the most colorful near the termination; (4) in using a diamond-pointed drill, the reviewer believes it to be highly important to provide means of gently rocking the stone while it is being drilled, in order to continually break down the "dead center" material; (5) on page 150, the first sentence should state: "If a ray of light traveling in air strikes a gem at *any angle* it will enter the gem," instead of the implication that the ray *in the air* must be less than the critical angle to enter.

For both amateur and commercial lapidist, the book will prove valuable.

George H. Marcher, C.G.

DIAMOND GLOSSARY

(Continued from Page 316 last issue)

polariscope. An instrument consisting essentially of two polarizers and a means of rotating an object between them. Used to determine whether a gemstone is singly or doubly refractive, and to a lesser extent to detect **anomalous double refraction** in a stone, which in a singly refractive stone like the diamond, indicates **strain**. If a hand instrument, designed especially for gem testing, such as the Shipley polariscope, it is known as a *gemological polariscope*. When incorporated in a microscope, the complete instrument is known as a *polarizing microscope*.

polarized light. Term loosely used to mean *plane polarized light*; light which has passed through polaroid or other polarizing medium causing it to vibrate in a single direction. See **polariscope**.

Polar Star Diamond. A famous brilliant-cut Indian diamond of 40 carats (about 41 m.c.), said by Streeter to have been purchased in England for the Russian Imperial regalia, and to have once belonged to Joseph Bonaparte, who paid 52,500 francs for it. More authoritative writers report that it belonged to Princess Yusupov (Yussupoff) or to Lussutow. It was not inventoried by Fersman as among the Russian crown jewels, and its present whereabouts is unknown.

Pole Mine. A diamond mine once listed among those in the Kimberley area, north of the city of that name.

polished girdle. A girdle which has been polished. In brilliant-cut diamonds girdles are fashioned with either uniformly smooth and circular surfaces, or more often with a series of more or less flat polished surfaces of irregular shape, which are not too accurately termed **girdle facets**. Circular polished girdles were once patented (in 1906 by Schenck) but upon the less perfect of these, flat polished surfaces or facets were left. In 1944 a patent was obtained (by Goldstein) upon a polished girdle with a definite number (40) of flat polishings, or facets, and later other firms revived the circularly polished girdle under various trademarked names, such as Circle of Light, Brilliant Circle, Halo Cut, etc. Polished girdles are usually thicker than are the usual rough girdles of well made brilliants. The girdles of emerald-cut diamonds are always polished, as are those of marquise and other fancy-cut diamonds.

polisher. (*In the diamond industry.*)

A term used to describe any workman who places any of the facets on a brilliant cut diamond, be he the lapper who places the table, culet and main facets, or the brillianteer who places the remaining facets on the stone. See **polishing**.

polishing. (*In the diamond industry.*)

The term used to include both **lapping** or **blocking**, and **brillianteeing**, as well as the production of any facet or other smooth, highly

reflective surface on a diamond; the final operation in fashioning a diamond, usually done with diamond powder on a horizontal disc or lap, against which the diamond is held in a dop. Diamond polishing was probably first practised in India and subsequently introduced into Europe (S. H. Ball), diamond polishers being reported in Nürnberg in 1373 (Bauer). Although L. de Berquem has been credited with the discovery of diamond polishing (Smith) about 1476, Berquem more likely introduced symmetrical faceting (Schlossmacher.)

polishing directions. (*In the diamond industry.*) The directions in which the diamond polishes most easily. In practice, this direction is generally found by trial and error, although it is always away from an octahedron face and toward a possible rhombic dodecahedron face (Kraus). These directions, in which the rate of polishing may be most rapid, are in what may be called **polishing planes**.

polishing grains. (*In the diamond industry.*) A term sometimes used for grains of powdered diamond employed in grinding or polishing diamonds and other substances. The size of such grains has an effect on the abrasive action and therefore on the so-called "hardness" of the diamond being fashioned (Grodzinski).

polishing marks. Undesirable marks left by the polishing skeif or wheel on a facet of a diamond or other gemstones.

polishing planes. The series of planes in diamond along which it can be most easily polished. Such series of planes lie parallel to a crystal-

lographic axis. Facets parallel to two axes of a cube octahedron or dodecahedron, and hence parallel to the face of a possible cube, are the easiest to polish; those parallel to the face of an octahedron, the most difficult. The ease and rapidity of polishing also varies in different directions, i.e., from right to left the rate may be more rapid than from left to right (Kraus). See **polishing directions**.

polysynthetic twinning. A system of thin laminae each composed of many very small contact twins. In diamonds some writers suggest it to be the cause of laminae which occasionally occur on the face of some diamonds, but both Sutton and A. F. Williams believe such laminae to be glide planes.

Pontianak. A city in Dutch Borneo near which was located that island's most important diamond field.

pork-nocker. Local name for a native gold or diamond digger in British Guiana who holds a mining license which, however, allows him to work only on other persons' claims. Also spelled "pork-knocker" and "porkknocker." See also **chebet**.

Porter-Rhodes Diamond. A diamond of fine color, found in the claim of Mr. Porter-Rhodes in the Kimberley Mine on Feb. 12, 1880. It was considered the finest African diamond yet discovered and was valued at 200,000 pounds; later at \$60,000. Smith states it was sold in 1937 to an East Indian. A. F. Williams stated its weight as 149½ carats (old). Unverified report, now recut as 56.60 mc emerald cut.

(To Be Continued)