Gems & Gemology

GEMS & GEMOLOGY is the quarterly official organ of the Gemological Institute of America. In harmony with its position of maintaining an unbiased and uninfluenced position in the jewelry trade, no advertising is accepted. Any opinions expressed in signed articles are understood to be the views of the author and not of the publishers.

VOLUME IV   SPRING, 1944   NUMBER 9

In This Issue: *Page*

Published by

THE GEMOLOGICAL INSTITUTE OF AMERICA

541 South Alexandria Ave.   Los Angeles 5, California

Status of the Diamond Industry as of April 29, 1944

by

SYDNEY H. BALL

Reprint of an address before members of the American Gem Society at the New York Conference.

Believe it or not, and strange as it may seem, the diamond industry in 1943, the fourth year of World War II, attained an all-time peak of prosperity, due to abnormally large sales of gem stones and to an ever-increasing wartime demand for industrials. The large sales of gem stones were due to two factors: the high wages earned by war workers in North America and the fear of inflation—a fear suffered not only here—but throughout the world.

The immediate future of the industry is assured, as stocks in the hands of the producers and the Diamond Corporation, once a menace because of their size, have been reduced to a dangerous minimum, nor are they likely to grow markedly unless by chance a new diamond field is discovered. For the principal mining companies will produce only what the current market demands.

The division between gem stones and industrials becomes more sharply defined as time passes, for while largely produced by the same mines, the two types differ markedly. Beauty and, to a less degree, hardness are the valued characteristics of the first; hardness and toughness, of the second; the first is never destroyed and adds itself to our ever-increasing stock of gem stones; the second is destroyed in a few months, being ground to dust in the service of mankind; one is ornamental, the other utilitarian.

The stocks of the principal diamond mining companies are traded in on the London Stock Exchange. In the first half of the year, they were market leaders and in that period they doubled in value. Those who bought $1000 worth of stock in these companies in mid-1941, 24 months later had a paper profit of $3500. As to dividends, the diamond mining companies did well by their stockholders in 1943.

The Diamond Trading Company, which in normal times sells 95 per cent of the world's rough, is said to have sold, in 1943, uncut diamonds to the value of almost £20,000,000, or twice that of 1942, which we all considered a lush year. It is believed the big sales increment was in gem grades, although in dollar value, sales of industrials also increased. In 1942, the latter accounted for 40 per cent of the sales; in 1943, if reports can be believed, 25 per cent. The company sells the commoner grades of the latter by kilo, although the trade still uses the carat.

It is stated that in recent "sights" the brokers are willing to buy five times what the company is willing to sell. Its stocks of many grades are believed to be depleted and its staff of sorters is inadequate. The Palestine cutting industry is already complaining bitterly of a shortage of small rough, its specialty in cutting.

In America, in 1943, the retail jeweler sold 26 per cent more than in 1942, itself a big year. As diamonds in the middle price brackets were among the most popular items, diamond sales were large. The answer: high wages among war workers and investment buying to partially offset inflation. In Europe, particularly, black markets thrived, as all preferred physical property to government paper of little probable value.

Imports into the United States are believed to have been large, although, as you know, our Government has not published such figures for over two years. The activity of our cutting shops suggests particularly large imports of rough and the big consumption of diamonds in the war effort, of industrials.

Since 1939, the price of rough has been increased 70 per cent and further increases are in the offing. Since the war began, melee has tripled or quadrupled in price; one-quarter-cut sizes have doubled and one-carat stones almost doubled; the increase in larger sizes is smaller, since the market is more restricted. A good one-carat stone is now worth from $650 to $1000, and superfine qualities even more. Fancies may be worth $3000 to $4000 a carat. The Trading Company states that, as a contribution to the war effort, it has not raised the price of industrial stones.

Gem stones have never been higher. After the war, with the re-establishment of the Belgian and Dutch cutting industries, the price of melee must crash. That of one-carat or larger diamonds may well hold, since the amount of fine rough available will be small and the cost of cutting such rough will be high.

There are now in the world about 10,000 cutters, one-third the prewar number, but capable of supplying an adequate quantity of cut, were it not for strikes and lockouts. The present fantastically high wage scale will, in the postwar period, doom some of the new cutting centers. Fancy a South African artisan is being paid more than Premier Smuts. Palestine, with 3000 employees, is the principal cutter of melee and our country and South Africa with, respectively, 1800 and 550 employees, of large. These industries, together with the smaller centers—Brazil, Great Britain, Cuba, Porto Rico, Canada, India and Borneo, must compete after the war with the cheap cutting costs, thanks to a reasonable wage scale of Belgium and Holland.

Due to the war, figures of production must be largely estimates, but the world's production in 1943 was about 8,200,000 carats, of which only some 1,200,000 carats were gem material, small and large. The production was but 63 per cent of that of 1940, war having not only reduced the staff at the mines, but also supplies essential to maximum production.

The Belgian Congo, as has been the case for a number of years, was by far the leading producer as to weight and also led as to value. The value of the diamonds produced by the various members of the British Empire, however, exceeded the latter figure. No pipe mines were operated in 1941 and 1942, but on September 1, 1943, DeBeers reopened the Dutoitspan mine, accounting for 1 per cent of the year's production, the rest coming from alluvial mines. The production of the Belgian Congo and the Brazilian mines and that of the South African diggings decreased as compared to corresponding figures in 1942, while that of South-West Africa increased somewhat.

We hear claims these days by irresponsible "authorities" that all we need to do is to develop the South American diamond deposits and be independent of Africa. The Brazilian fields have been known for over 220 years, those of British Guiana for over 50 years, and those of Venezuela for over 20 years. Last year, notwithstanding this, the three together accounted for only 4 per cent of the world's production and 2½ per cent of its consumption. Referring to South America, diamonds are reported to occur in eastern Bolivia.

Dr. N. R. Junner during the year published a classic account of the Gold Coast diamond fields, with which every student of gemology should be familiar.

Sierra Leone last year produced two large gem diamonds, one over 500 carats. It thus joins the select group of large stone producers, India, Borneo, South Africa and the Bagagem district in Brazil. But today large gem stones are not the prizes they once were; no one has the inclination these days to buy cut stones of 200 to 300 carats.

The Bureau of Mines during the year did some development work on the Arkansas diamond pipe at Murfreesboro. A certain number of small stones were recovered, the first diamonds produced in America since 1936.

This year the world diamond production may exceed that of 1943. The United Nations have requested the Belgian Congo to double its production and DeBeers is adding an extra shift at Dutoitspan.

To this group, little need be said about the use industrially of diamonds. These stones come as a by-product from the same mines which produce gem stones, although the largest diamond producer in the world, the Belgian Congo B.C.K. mine, produces only a few gem stones. No implement of war is made without the help of industrial diamonds and our country, which used from 1,500,000 to 3,000,000 carats a year before the war, now uses 10,000,000 carats. Postwar consumption will be large.

The diamond industry can face the future with confidence; its stocks have been depleted to a dangerous extent; the sale of industrial stones will hereafter be an important source of revenue to the producer, and production of rough gem stones will be geared to consumption, for the diamond producers, unlike their confreres in other branches of mining, dare to shut down their mines if new supply and demand are out of balance.

American-made Synthetic Crystals

by

A. K. SEEMANN, Engineer

The Linde Air Products Company

Reprint of an address before members of the American Gem Society at the New York Conference.

The development and perfection of American-made synthetic crystals represents one of the important achievements brought about by the insistent necessity of a world at war. At the time the war began our curiosity in the creation of synthetic crystals in the oxy-hydrogen furnace was purely academic. But it was quite natural for us to be interested in them, for a major portion of the research in our business has been devoted to reactions conducted at very high and very low temperatures—our high-temperature work being more specifically concerned with the oxy-acetylene flame.

We had not progressed very far in our experiments with synthetic crystals before the Government—aware of a grave shortage of jewel bearings and jewel-bearing materials—asked if we would endeavor to speed up our experimental program in order to produce synthetic corundum in sufficient quantity and quality to supply a fabricating industry which was about to be established. Our answer to this challenge was a 16 months' intensive research program, the first tangible result of which was the opening of a boule plant in April, 1942. Very fortunately, fabricating facilities were completed at about the same time, so that the industry has been furnished with an uninterrupted supply of the necessary raw material.

The manufacture of synthetic corundum of jewel-bearing quality is quite different from any other process with which we are familiar. Most manufacturing processes lend themselves to precise scientific control, and, while certain steps in the manufacture of synthetic sapphire can be so controlled, much of the task is an art acquired only after considerable experience. Our early experiments were most disheartening. We assumed that our troubles could be wholly traced to improper boule-furnace technique, but found that this was but a part of the story.

It was necessary to conduct an entirely separate research program on the manufacture of alumina in order to provide a source of material pure enough to manufacture large, water-clear corundum boules. It naturally would be assumed that chemically pure grades of alumina would be of sufficient purity for our purpose, but it was found that even unbelievably small traces of certain impurities could not be tolerated.

In retrospect, it is rather easy to review the many difficulties which were encountered in these early days, but their solution then required precious time and extraordinary effort. We knew, however, that synthetic corundum crystals, both clear and ruby, had been manufactured in Europe for many years, and it was a challenge to our ability to compress into a matter of months the mastery of this skill. Unavailability of skilled European artisans forced us to rely solely on our own ingenuity.

Most of the sapphire jewel bearings that have been made in this country have been manufactured from water-clear corundum. Suitable corundum boules must be homogeneous, of proper crystallographic orientation, and free from harmful bubbles, feathers, or other inclusions. They should have a minimum of the tiny gas bubbles which are seen in synthetic crystals only under a microscope. Preferably, they should be cylindrical in shape in order to yield a maximum number of finished jewels. The specifications for boule are necessarily rigid because internal defects may not be revealed until final polishing of the finished jewel. A brief description of the process whereby both corundum and spinel crystals are grown will furnish an insight into a few of the manufacturing difficulties.

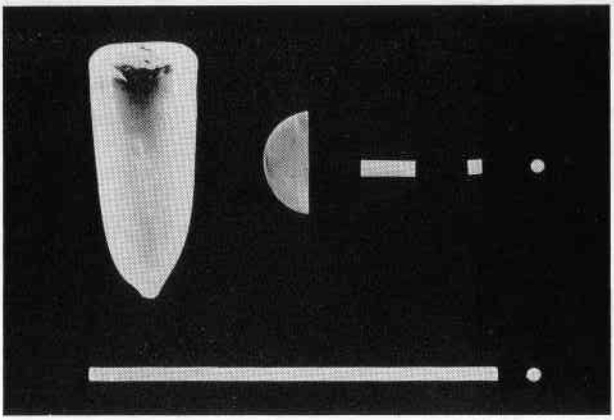
In 1902 Verneuil announced the process which bears his name, and which is commonly used to grow corundum and spinel crystals in an oxy-hydrogen furnace*. Oxygen and hydrogen are fed into an inverted burner, the oxygen stream carrying finely divided alumina, which fuses while passing through the flame, and collects on a pedestal beneath the burner nozzle. The fused particles of alumina coalesce to form a tiny crystal, and through proper technique this is made to grow in the form of a cylinder approximately ¾ inch in diameter and 2 or 3 inches in length. The alumina powder is fed into the burner in small increments, since this is necessary for the growth of a clear, homogeneous crystal.

*For illustration of furnace see page 89, Summer, 1943, *Gems & Gemology*.

Corundum melts at 3,750 degrees Fahrenheit, and the temperature range in which it is necessary to conduct deposition is very limited. The particle size of the powder greatly influences the success of the process and we are now using a powder with a particle size of less than one-tenth of a micron. It is difficult to appreciate the minute size of these particles, unless you realize that, when magnified 50,000 diameters, the image is about the size of the head of a pin. A penny magnified 50,000 times would be over 3,000 feet in diameter.

Corundum crystallizes in the hexagonal system, and one expert has aptly characterized hexagonal crystals as "a perfect example of an imperfect crystal." One of the important objects of our synthetic crystal program has been to grow a single, homogeneous crystal. But having attained this objective, it was found necessary to go a step further and study the crystals themselves. Our physicists and spectroscopists with the aid of such instruments as the electron microscope and the X ray have discovered valuable information regarding crystal orientation, which makes it possible for us to furnish material that enables the fabricator to produce superior articles with a minimum of waste.

The average corundum boules which we currently produce are about 200 carats in size, and we have grown single crystals as large

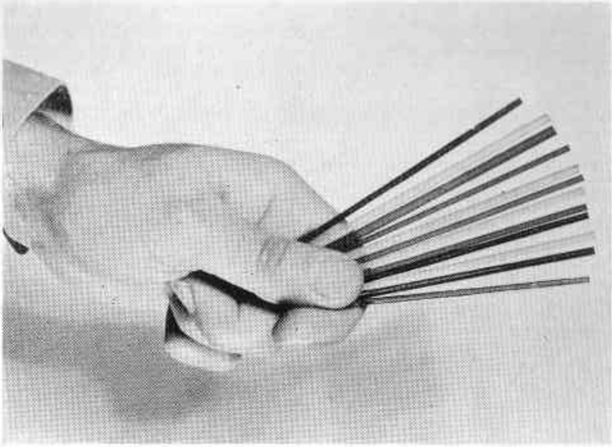


This picture graphically illustrates the advantages of the rod form over the boule for the fabrication of jewel bearings and other small articles. Rod is merely sawed to make roundels. Half boules require several sawing operations followed by centerless grinding to obtain roundels.

as 550 carats. Experimentally, we have produced spinel boules in excess of 1400 carats.

As you can well appreciate, the entire production of sapphire at the present time finds its way under allocation into military articles, the major portion of which are jewel bearings. In order to furnish material suitable for its end uses, we studied the fabrication of jewel bearings from sapphire boule and observed that it took a considerable amount of labor and consumed significant amounts of diamond and of sapphire itself to complete the slitting operations, which produce the roundel or blank from which the several types of bearings are made. Believing it to be our responsibility to furnish material in its most useful form, we experimented and have succeeded in producing long, slender crystals known as corundum rod, which, when sliced, furnishes the blanks without the several intermediary steps necessary when working with the boule form. At the moment we are creating additional production facilities so that the jewel-bearing manufacturers can take advantage of this improved form of material. One or two plants are now fabricating their entire production from corundum rod.

We realize that the principal interest of this Society lies in synthetic crystals that may be fashioned into stones suitable for jewelry. Except for the ruby, which is in small demand as an industrial material, all of the industrial applications specify water-clear corundum. We have therefore devoted very little time to the production of colored varieties suitable for jewelry. At the moment we have experimentally produced ruby in a variety of shades, several of which are considered suitable for jewelry purposes. At such



Each of these synthetic sapphire, ruby, and spinel rods is a single crystal. Production of corundum and spinel in this form saves time and material in the manufacture of jewel bearings and other small articles.

time as corundum is removed from mandatory allocation, we will be in a position to furnish ruby boule to the gem-cutting or lapidary trade.

We have compared our production with synthetic ruby of European origin and find it to be of equal quality. It is our present opinion that the American market will consume a sizable quantity of synthetic rubies which are of American origin and manufacture. We have also experimented briefly with blue spinel and have succeeded in producing a variety of shades. When conditions permit, we expect to offer this material to the American jewel cutters and are prepared to consider other synthetic crystals, such as the aquamarine.

We wish especially to direct your attention to the fact that we are raw material suppliers, and that the several synthetic crystals which we produce will be sold to the fabricating industry, whether it be the jewel-bearing manufacturer or the lapidary. We believe that the durability, beauty, and perfection of our synthetic crystals are in themselves definitely attractive features, which make them useful industrially as well as in the jewelry field.

We do not wish to pose as gem experts, but we are reliably informed that the ordinary jeweler using a loupe might find it difficult to distinguish between a synthetic ruby and a first-quality natural ruby. We are further informed that among the telltale marks are the imperfections found in the natural stone; in other words, the perfection so seldom found in natural ruby is usually present in the synthetic product.

One fact should not be overlooked, and that is that many thousands of European-made synthetic rubies have already been marketed in this country and that our product is just about the same in appearance and quality. Therefore, the problem is not a new one, but one which likely has already occupied the attention of those interested in the jewel industry. We may then rely upon the known tests that have already been developed and used in the past to differentiate between the natural and synthetic product.

These facts are mentioned not to initiate a controversy but rather to be carefully considered by your Society, so that the unsuspecting purchaser will not pay for a natural ruby and obtain a synthetic crystal. Already a certain amount of misinformation has sprung up in various sections of the country, and we should appreciate receiving the suggestions of this Society relative to the corrective and educational measures to be used for properly informing the industry and the public.

In conclusion, we would be remiss if we did not mention with sincere appreciation the constructive and helpful interest that Mr. Shipley, and other members of the American Gem Society and The Gemological Institute, have shown in our synthetic crystals. Your publications, *Gems and Gemology* and *Guilds,* as well as your textbooks and other literature have also been extremely helpful.

SYNTHETIC EMERALDS TESTED

by

EDWARD WIGGLESWORTH, Ph.D., C.G.

Director, Eastern Headquarters, Gemological Institute of America

The Institute recently received as a gift four cut and three rough synthetic emeralds. These have been examined at the Eastern Laboratory and, while nothing new from what has previously been reported was found, a brief statement here may be of value.

The actual process of making synthetic emeralds is still kept as a secret by the manufacturer. However, it is obviously a different process than that used in the manufacture of synthetic corundum and spinel.

We do not find bubbles or curved striae, but in their place we find wisplike inclusions which were described by Robert Shipley, Jr., in the July, 1935, issue of *Gems & Gemology*. These wisps usually are seen in groups which seem to be in the center of the stone and elongated parallel to its length. In other words, they extend in the same direction as a crystal axis, undoubtedly the vertical axis. In some of the specimens there are also straight parallel lines at right angles to these.

The wisps, when well illuminated on the diamondscope and using the 22.5 magnification, are apparently made up of liquid inclusions somewhat similar to those seen in sapphires from Ceylon. These wisplike inclusions readily distinguish the stone from genuine emerald whose inclusions are very characteristic.

The refractive indices as meas-

(Continued on Page 137)

Diamonds and Diamond Tools

by

PAUL GRODZINSKI, Manager

Diamond Research Department

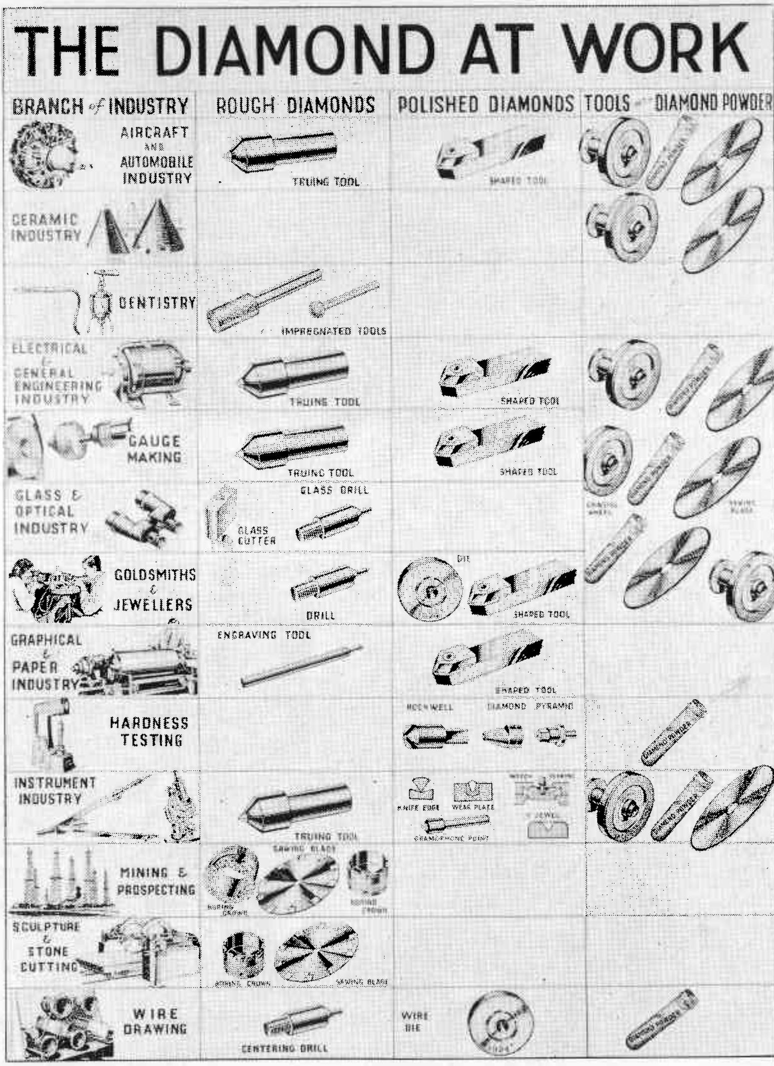
The Diamond Trading Company, Limited

Diamond is a mineral, pure carbon, which is found only in nature by mining (South Africa) and in secondary alluvial fields (South Africa, South-West Africa, Congo, Angola, Sierra Leone, Brazil, and British Guiana, the last two in South America). Diamond is mainly a crystal. Amorphous and cryptocrystalline formations (Ballas, Carbonado) are also known. Colour from white transparent to black and opaque. White and light yellow diamonds are preferably used as ornament, the favoured shape is today the "brilliant." Big stones are seldom. For diamonds not useful as ornament a big demand exists for industrial applications. Today nearly 75 per cent of all diamonds found are used for this purpose, and for this reason it is not justified to call them inferior.

In modern industry (see illustration) diamonds are used in three different forms:

1. One or more rough diamonds are set into steel holders and serve as truing tools for grinding wheels. When numerous diamonds are set on the end of a tubular holder, they serve as drilling crowns (the American expression is drill bits) for deep drilling and exploration drilling. Further rough diamond tools are used in stone saws, as glass cutters (glazier's diamonds), for engraving purposes, dentists' drills, etc.
2. Shaped diamond tools have cutting edges which are highly polished, similar to the surfaces of ornamental stones. They serve for cutting all different kinds of metals, for shaping fine grained thread-grinding wheels; also as diamond dies; as hardness indenters for testing materials, and as jewel bearings and wear-resisting plates.
3. Crushed diamonds and diamond powders: Impure diamonds and broken pieces are crushed, then embedded in metals or plastics (Bakelite) and used as grinding and polishing tools for hard materials, in particular ceramic material, and the so-called hard metals. During the last few years there has been a big demand for very fine graded diamond powders with grain sizes of 1 micron and less.

Truing Diamonds for grinding wheels: The accepted method today for finishing soft and hardened steel components is by grinding by means of a vitrified abrasive wheel. These wheels lose their shape or are clogged up and therefore need truing from time to time, an operation which only the diamond point can stand. In spite of the fact that tools exist, such as star wheel dressers and abrasive sticks, no known material is as suitable for the truing of precision grinding wheels as the dia-



Reproduced by courtesy of the Research Dept., The Diamond Trading Co., Ltd.

mond. The diamond holder should be somewhat inclined toward the grinding wheel (drag angle) and contact the grinding slightly below centre line or directly on centre line.

Tubular drilling crowns provided with diamonds, invented in 1862, make it possible to produce in hard rock the deepest bore holes in the world. About the same time the first diamond saws were produced. They permit a more economic cutting of stones.

Among the oldest diamond tools are glass cutters and engraving tools for stone and metals. Usually rough diamond points with a sharp cutting edge (not a point) are preferred.

Shaped diamond tools, i.e., tools with diamonds having polished facets and forming a real cutting edge, similar to ordinary lathe tools, are extensively used for the precision machining of bearings and pistons in aero-engines and other parts which must have a fine surface finish combined with great wear resistance. Such tools have even been used for finishing hardened steel surfaces.

Recently the grinding of threads on hardened parts has been developed and in this process shaped diamond points (cube-shaped, V-shaped and conical) are indispensable for reconditioning the wheel to its original form. In order to reduce the diamond consumption for multi-ribbed wheels down to certain pitches, crusher rollers of hardened steel are used, but these again need truing diamonds for the grinding wheels by which they are produced.

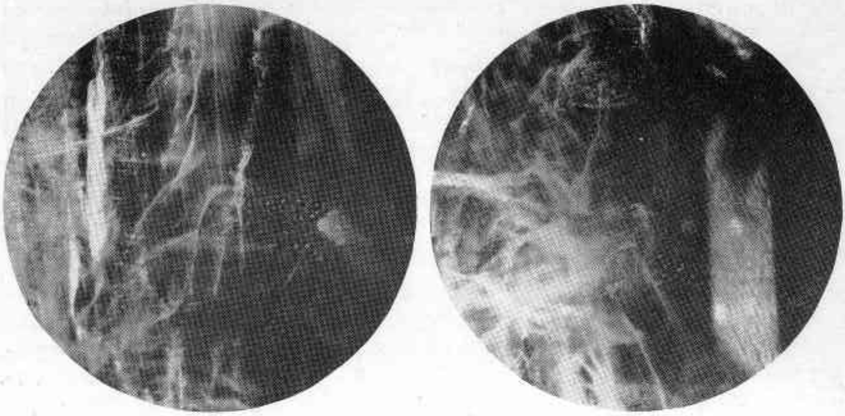
Shaped Tools: Diamond dies with drawing channels down to 0.0004 in. diameters are produced for drawing the fine filament wires of tungsten for electric lamps and other fine wires. This industry has been newly established in England during the war.

In hardness testing of metals which develops to one of the most important routine methods without destruction of the component, the diamond is almost indispensable. As much as accepted methods show variations, they all rely in accuracy of testing and durability on the diamond (Rockwell, Alpha, Vickers, Shore). The reason for the preference of the diamond is that smaller impressions can be made which do not interfere with the intended use of the part as machine component or tool. Still more sensitive indentation tools and instruments are being developed to investigate structure and hardness differences in metals, such as the elongated pyramidal diamond, according to Fr. Knoop, and the pyramidal diamond mounted on a glass lens, according to Hanemann-Bernhardt.

The testing and measurement of surface quality is one of the most urgent manufacturing problems necessitated by the increased demands on wear resistance and accurate fitting. At the present state of technique, feeling lever or tracer point instruments show a better indication than optical instruments. These usually electro-mechanical instruments use, after unsuccessful trials with hardened steel needles, exclusively sapphire and diamond needles.

Diamond dust has slowly but steadily developed to one of the most important abrasive materials. The main problem seems to be the uniform grading of the abrasive materials in the subsieve sizes for fine grinding and polishing purposes. In this range (finer than 300 to 400 mesh per linear in.) special methods are necessary, such as settling in water and air or by centrifugal methods; optical inspection methods are necessary. Diamond dust can be used either "loose" or "bound." In the first case the diamond grain has to be mixed with oil or grease and is applied to lapping tools of metal or wood. Great progress has been made in uniformly and firmly embedding diamond grains in bakelite or metal powders which are

(Continued at Bottom of Following Page)



Photomicrographs, taken through Diamondscope by Mr. and Mrs. H. D. Hastings, showing (left) general view of wisps, and (right) cracks and clouds.

SYNTHETIC EMERALDS TESTED

(Continued from Page 133)

ured on the Rayner Refractometer, seem to be slightly lower than that usually given for beryl (1.57-1.58). On the four gems, we obtained readings of 1.56 and 1.57 on three, and 1.57 on the other. In this we seem to be in agreement with others who have reported on them. All showed strong dichroism with blue-green and yellow-green. When examined under the emerald glass in strong transmitted light, all the stones showed rose-red.

The specific gravity of all was somewhat below that of genuine emerald. Anderson states that emerald should be about 2.71, aquamarine slightly lighter (2.69), and morganite considerably heavier (2.80). The figures obtained by us were 2.65, 2.66, 2.65, and 2.67. These, we feel, are reasonably accurate, as they were obtained on the Berman Density Balance. The stones weighed 34.6 mg to 135.5 mg (200 mg equals 1 carat). The optic character of one stone was obtained and found to be uniaxial negative.

DIAMONDS AND DIAMOND TOOLS

(Continued from Page 136)

formed into metal compacts. Such wheels are extensively used for the grinding and lapping of sintered carbides, tool tips and dies, as they represent the cheapest and quickest method for this purpose.

DIAMOND GLOSSARY

(Continued from Page 124, last issue)

Lumpy. Term applied to a diamond the pavilion or base of which is cut too deep. Such stones lack brilliancy or have a dark non-brilliant spot in the center called a well. Also applied to a diamond whose *total* depth is too great in proportion to its girdle width. Sometimes called "thick stones."

Lumpy Girdle. A too-thick girdle.

Lupe. The German equivalent of loupe. See Loupe.

Luster. The appearance, in reflected light, of the surface of a mineral. The luster of most rough diamonds is described as greasy, that of fashioned diamonds as adamantine.

Maacle. Same as **macle.**

Macle (French). Twin. Term used in the diamond trade for a flat triangular rough diamond which is a twinned crystal of the spinel twin type. More difficult to fashion than most other crystals because of the differing cleavage directions in the twins. See **twinned crystals; twinned crystal.**

Macled Stone. Same as **macle.**

Macroscopic. Large enough to be observed without the microscope. Same as **megascopic.**

Magma. Molten (liquid) rock material within the earth; the molten mass from which any igneous rock or lava is formed.

Magnetite (magnetic iron ore). Present in kimberlite as a primary mineral, as a primary transported mineral and as a secondary mineral.

Magnetite Twin. Same as **polysynthetic.**

Magnifier. Anything which magnifies. See **loupe; gemolite; gemoscope; Diamondscope; Diamond Imperfection Detector; microscope.**

Mahabharata (ma-ha-ba'-ra-ta). A Hindu epic containing early information about India.

Mahanadi River. A river in India near which diamond mines were located.

Main Facets. The bezel and pavilion facets of a brilliant cut diamond.

Make (of a diamond). Trade term referring to the correctness of the proportions and to the polish of a fashioned diamond. Making a diamond includes cleaving or sawing or both; rounding up, and grinding and polishing the facets on the diamond. A well-made diamond is one which is well proportioned, with facets of even size placed at approximately proper angles to the plane of the table, and with all facets highly polished.

Mangelin (man'g'line). Hindu measure of weight equal to 1⅜ carats.

Manik. An old East Indian term for greenish diamonds.

Mari-diamond. Rock crystal from India.

Markings (on diamond crystals). See **etched figures; trigons.**

Marmarosch Diamond. Quartz.

Marquise Cut (mar-kese'). *A cut,* a variation of the brilliant cut, usually with 58 facets but elongated so that its outline from above is that of a boat and from the side that of a lens. Same as **navette.** *A finger ring* in which stones are contained in a setting which from above has the same outline as that of the marquise cut.

Mascarenhas I and II. Two diamonds which belonged to Portuguese viceroy, Dom Philip de Mascarenha. Seen by Tavernier in Goa (1648). Weigh 57 and 67½ carats, respectively. Tolerably pure, of good water. Cut in Indian fashion.

Mass (of a diamond). Term used for a rough diamond during the early operations of fashioning it.

Massa. Brazilian term for diamond deposits lying high on the hills and plateaus above the present water courses.

Matan Diamond. Same as **Mattan diamond.**

"Matara Diamond" (ma'ta-ra) or "Matura diamond". Ceylonese name for colorless to faintly smoky zircon, most of which have been decolorized by heating. Some naturally colorless may come from the district of Matara or Matura Ceylon.

Matura Diamond. Same as **Matara diamond.**

Matrix. The rock in which diamond or other mineral is found. See **kimberlite.**

Mattan or Mattam Diamond. An unauthenticated Borneo stone said to be an almost colorless diamond weighing 367 carats, said to have belonged to the Rajah of Mattan, and to have once brought an offer of $150,000 and two large war brigs. It is also said that great healing powers are ascribed to this stone and that it is rarely shown and never allowed out of the royal treasury.

Matto Grosso. A state or territory of Brazil in which diamonds have been found.

Mauve Diamonds. Pinkish violet or very light purplish diamonds often called "pink diamonds" in the trade. Among the rare fancy colors. Very pale mauve diamond is included by Sutton in his classification as a subdivision of his brown diamond group.

May Mine. Old diamond mine in Kimberley district.

Mazarin, Jules, Cardinal. (1602-1661). A French cardinal and statesman, prime minister under Louis XIV. The cardinal is given the credit, if not for developing the earliest form of the brilliant cut, at least for popularizing it.

Mazarin. A Mazarin cut diamond. More specifically one of the first examples of such diamonds. The *twelve Mazarins* were famous, being the largest twelve of the French crown diamonds to be recut in this style. All disappeared before 1791, when the government inventory listed only "the tenth Mazarin" weighing 16 carats.

Mazarin Cut. The earliest form of brilliant cut, introduced about middle of 17th century; thick, square with flattened corners and with 16 facets and square table on the crown and 16 facets and large square culet on the pavilion. See **Mazarin.**

Mechanical Dop. A dop in which a stone is fixed by mechanical means so that it may be held at desired angles, as against a skeif or polishing wheel.

Megascopic. Visible to the unaided eye; in contrast with microscopic; same as **macroscopic.**

Melange. An assortment of diamonds of mixed weights and of sizes larger than melee.

Melaphyre. A rock, through deposits of which the South African diamond pipes extend, and which is also found in kimberlite as both large and small inclusions. It is an amygdaloidal diabase—an altered ancient fine grained basaltic lava.

Melee (mell'ee). A trade term used collectively to describe smaller-sized brilliant cut diamonds whether full cut or not. In general, when shown or sold in lots or when prices are quoted, the designation melee may refer to such diamonds, up to .20 or .25 carats. In general, all small gem stones used in embellishing mountings or settings of a larger gem are called melee. See also **sizes; smalls.**

Melilite-Basalt. An ultra-basic basaltic rock which is found in many volcanic pipes of South Africa and which was apparently formed from the same magma which gave rise to kimberlite.

Melle. A Brazilian term for diamonds of inferior quality. (Jewelers Circular—Keystone).

Mercury Vapor Lamp. Lamps used in the detection of fluorescence in diamonds, employing vapor of the mineral mercury. See **fluorescence.**

Metamorphic. Of, pertaining to, produced by, or exhibiting metamorphism (Webster). See **metamorphism.**

Metamorphism. The geological change in chemical composition or in the structure of a rock or mineral by heat pressure and other natural agents.

Meteoric Diamond. Diamonds found in meteorites of very small to microscopic sizes.

Meteorites. Masses of stone or metal which have fallen to the earth from outer space. See **meteoric diamonds.**

Metric Carat. See **carat.**

Metr'c Grain. See **grain.**

"Mexican Diamond". Rock crystal (quartz).

Mica. A group of minerals gemologically important as inclusions in various gem minerals and in kimberlite, where the species phlogopite occurs more frequently than other micas.

Micrometer. Any instrument for measuring very small dimensions or angles. See **millimeter screw micrometer.**

Microscopes. Instruments which magnify small objects such as inclusions in diamonds, the observation of many of which is often impossible because the strong reflection of light from the surface of polished diamonds obscures the view of the interior. See **Diamondscope; polarizing microscope.**

Milky Diamonds. Diamonds which have a milky appearance, particularly in right-angle illumination, or in the Diamondscope, probably due to presence of a large number of very small internal fractures or other causes mentioned under cloudy texture.

Mill. *Diamond fashioning.* Trade term for the entire machine upon the wheel or skeif of which diamonds are ground and polished. *Diamond mining.* The building or buildings and adjacent establishment in which diamonds are recovered from kimberlite by crushing, panning, jigging, and washing over greased tables.

(To Be Continued)