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"RECONSTRUCTED RUBIES" FOUND TO BE SYNTHETIC CORUNDUM

by Lester B. Benson, C.G., F.G.A.

RECENTLY a number of stones have appeared on the market that were thought to be reconstructed ruby. Although the exact process used for the commercial production of synthetic corundum has been known for many years, the degree to which synthetic material may overlap in appearance the reconstructed stone is given little attention in present text books. In fact, little information has been published concerning the exact method used to produce reconstructed ruby.

This also applies to the characteristics of synthetic stones that were produced during the period of transition which led to the commercial production of synthetic ruby by the Verneuil process. Failure to record characteristics of these early stones is due largely to the fact that suitable equipment for photomicrographs (that could reveal and record the characteristics of cut gemstones to full advantage) was not available at that time. Although it has been implied that large quantities of reconstructed stones were produced, securing such material for study has always proved extremely difficult.

By standard U.S. definition, reconstructed stones were made of fragments of genuine stones sintered together under intense heat with or without pressure. By the method of manufacture necessary to fit such a definition, the ruby fragments would have to form a mosaic joined by fused sections that may or may not have assumed a crystal structure upon cooling. Natural characteristics would be expected in the unmelted portions of the ruby fragments.

Only a few such rubies have been reported in gemmological literature which combine in any way the characteristics of natural material and material that had been melted. One of these was the one reported by Anderson.[1] This had the characteristics of a synthetic ruby but obviously had been grown from a natural seed crystal. A re-examination of the characteristics of so-called reconstructed rubies reported in recent years—together with stones offered recently to the G.I.A. as reconstructed—suggests a need of a revaluation of the whole reconstructed problem.

Although experiments on the reconstruction or synthesis of rubies began in the early 1800's, apparently it was not until approximately 1882 that a few stones appeared on the market labelled " reconstructed." According to an unconfirmed report these were thought to have been made by a priest in a small town in Switzerland, and the report stated that the stones were produced by binding together small particles, or chips, of genuine ruby by fusing small particles of quartz. Obviously, a strict definition would not permit such stones to be considered reconstructed but, instead, merely silica bonded rubies. At any rate, these stones supposedly duplicated the appearance of fair quality rubies and were sold at relatively high prices.

The essential identifying characteristics of such stones would be variable hardness due to the amorphous and soft nature of the bonding agent, in contrast to the corundum fragments and a lack of extinction characteristic of a doubly refractive crystal when rotated in the polariscope. This would result from the random crystallographic orientation of the silica bonded fragments. However, if such stones *were* ever made on a commercial basis they could not have gained much importance since none have been encountered, or at least reported.

In 1877 the first synthetic corundum was produced, but it was not of gem quality. Gem quality material, according to one report, did not appear on the market until about 1886. If this is

[1] B. W. Anderson : *Reconstructed Rubies*, Gems and Gemology, Summer 1949, page 187.

correct, they were undoubtedly confused by some jewellers with the first so-called " reconstructed " stones, and sold as such.

Between 1880 and 1890 a Swiss engineer was supposed to have produced true reconstructed rubies from ruby sand on a commercial basis. These were referred to as " Geneva " rubies and the boules were stated to have been about the size and shape of a shoe button. (A similar description is applied to the first synthetic boules produced by Verneuil).

Whether all of these " Geneva " rubies were made by fusing together ruby powder only, or whether they were just bonded fragments, is unknown. The definition referred to earlier would cover bonded fragments only. However, we are led to believe that these stones were made from powdered natural rubies with the addition of chromic oxide in the later stones to improve their colour.

Actually, since the possibility of producing synthetics had been made known in 1886, there seems little likelihood that any great amount of time was devoted to the production of reconstructed ruby when gem quality natural ruby, even in small sizes, is relatively scarce and costly. This indicates the possibility that much of the so-called " reconstructed " ruby produced prior to 1900 was, in reality, synthetic.

For some reason, the characteristics which have been associated with synthetic corundum in the majority of gemmological publications are those common only to boules formed by the Verneuil process as we know it to-day. The implication is that rubies produced prior to the Verneuil announcement were reconstructed. However, investigations to date have not verified this. On the contrary, there is strong evidence indicating that rubies were made by accretion of molten material, grown into a single crystal long before the Verneuil process was announced.

From study of material that fits the description given to " reconstructed " stones at that time, it seems evident that such accretion can form a single crystal even though the deposition is interrupted or uneven over the surface. The existence of a structure which is divided into several areas (Fig. 1) each containing symmetrical and closely spaced curved striae, but with the general orientation of the striae in each area differing from that of the adjoining area, is not necessarily indicative of reconstructed stones.

On the contrary, such stones could have been produced by fusing alumina powder, but with haphazard and changing orientation of the boule in relation to the direction from which the powder was deposited. In this latter instance, the uneven surface growth will result in low angle to even high angle intersection of the growth lines at the points where each of these areas are grown together. This is not encountered in a boule grown with the assistance of a mechanical apparatus that provides constant orientation of the boule and even distribution of Al_2O_3 powder on the growing surface. This is accomplished in the modern Verneuil oven.

Stones produced by sintering natural fragments would possess very irregular striation, particularly for the adjoining areas of the fragments. Obviously, there would be little advantage in powdering grains of natural ruby to obtain the powder necessary to produce a well-formed boule when the resultant stone, in appearance, could be duplicated with commercially prepared powder at a much lower cost. It should be noted that intersecting striae do not indicate a structure composed of several individual portions, each with a different crystallographic orientation. Instead, intersecting striae generally indicate the direction of growth only for each of the given portions.

The latest group of "reconstructed" rubies submitted for examination were on the average of one half to three fourths carats in weight and possessed numerous erratic gaseous inclusions and pronounced intersecting curved striae (i.e., all the characteristics often associated with so-called reconstructed stones). Many of the gaseous inclusions are developed into elongated and angular forms similar to the gaseous inclusions seen often in natural stones.

Further investigations revealed, however, that these were nothing more than stones that were cut from the bottom tip of synthetic boules. It is generally assumed that this portion of a synthetic boule is discarded as waste. However, in an attempt to secure a quantity of these tips for examination, it was learned that many cutters in this country have channelled these boule tips to foreign cutters—particularly in the Orient—and have obtained prices for this material in excess of that usually received for flawless synthetic corundum. Apparently a large quantity of this material has been cut and returned to the trade, presumably as natural ruby. Since

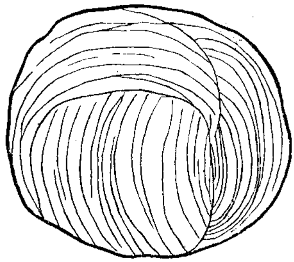


Fig. 1

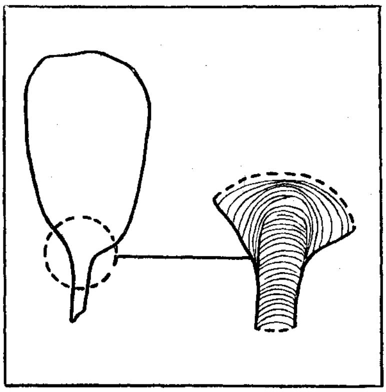


Fig. 2

they are highly flawed to the unaided eye, they could easily pass undetected in a parcel of natural stones.

The presence of intersecting curved striae is easily accounted for when considering the nature of the seed material used to start the boule. The majority of the stones that have been examined at the G.I.A. laboratory were taken from boules that had been started from oriented colourless rods—obviously, then, of fairly recent manufacture. A typical side view of the relationship of the growth lines in the rod to the surrounding material, and the corresponding area from which these stones were cut, is illustrated in Fig. 2.

Depending on the exact nature of the seed, and the orientation of the cut stone in relation to the original boule, the striation in these stones may appear through the table as intersecting striae, oval-shaped striae, or completely circular and tightly curved striae. Furthermore, depending on the colour, or lack of colour, of the "seed," these stones sometimes display rather patchy colour distribution.

Fig. 3 pictures a cross section of a boule tip showing the concentration of bubbles and curved striae present in the rod, and a similar concentration of bubbles and striae to the right, showing the general pattern of growth of the boule from the rod.

Fig. 4 shows a different boule tip in which the top of the rod seed is well outlined. The surrounding boule is lacking in both bubbles and noticeable striae.

Fig. 5 shows half of another boule tip, with the direction of observation being made parallel to the rod seed. In this particular case the rod is visible as a colourless, flawless centre surrounded by the highly flawed and striated red synthetic corundum.

Fig. 6 reveals another characteristic—highly concentrated and elongated bubbles spreading out in a fan-shape from the centre of the rod. It should be noted that in nearly all cases where elongated bubbles are found in synthetics they are laying perpendicular to the growth lines. This is also shown in Figs. 3, 4 and 5. This characteristic would not be expected in a stone composed of sintered fragments, or one grown by melting fragments together.

Intersecting striae as well as the typical bubbles occur in stones cut from this material. Since a synthetic boule could just as easily be started from a natural seed or a fragment of another synthetic boule, the characteristics mentioned do not necessarily cover all that could be expected from stones made in this manner.

A second type of material presented to this laboratory as reconstructed ruby consisted of small " shoe button-shaped " boules of about three eighths inch in diameter. One of these boules is shown beside a typical modern synthetic boule in Fig. 7. They had been taken from a larger group of similar boules that had been in a jeweller's stock for many years, and were referred to on the invoice as " reconstructed rubies." The surface of these boules exhibit small, slightly raised circular areas which indicate that the boule was built up by a succession of deposits at different parts of the surface.

However, a cross section indicates a fairly even placement of striae beginning from the nucleus and accumulating to the outer edge. A small button on the bottom of the boule had been fused

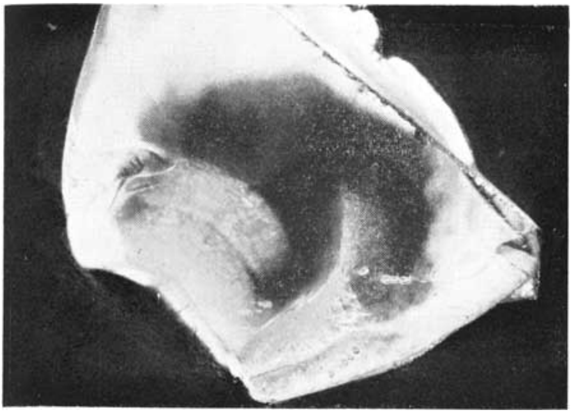
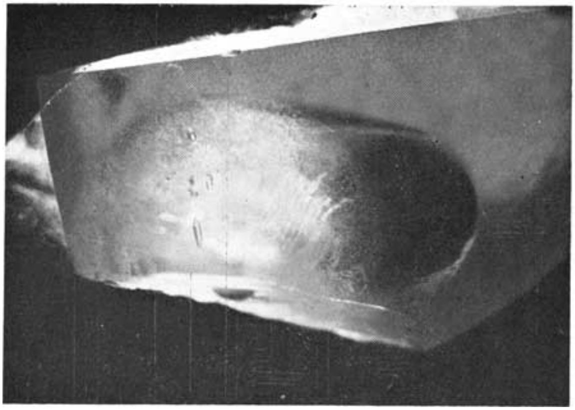


Fig. 3

Fig. 4



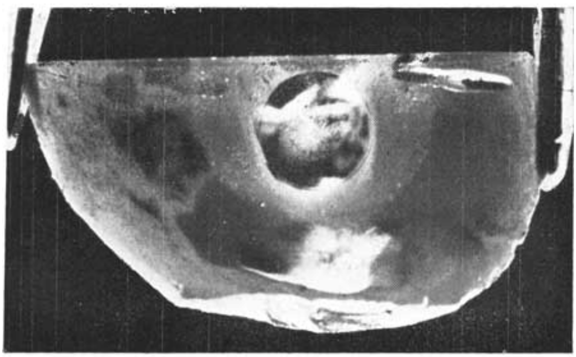


Fig. 5

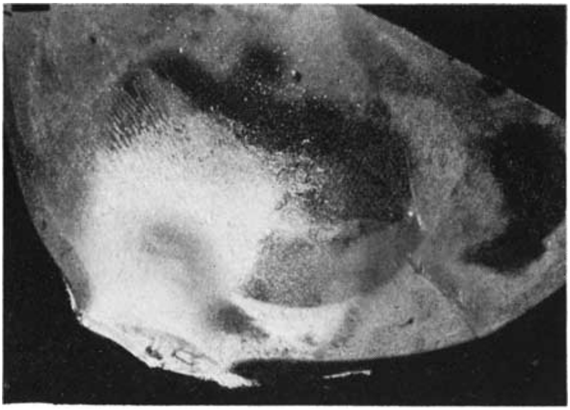


Fig. 6

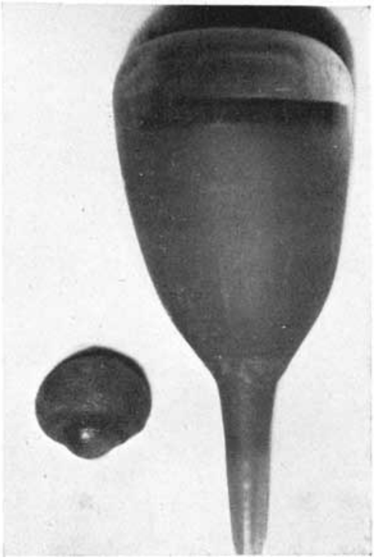


Fig. 7

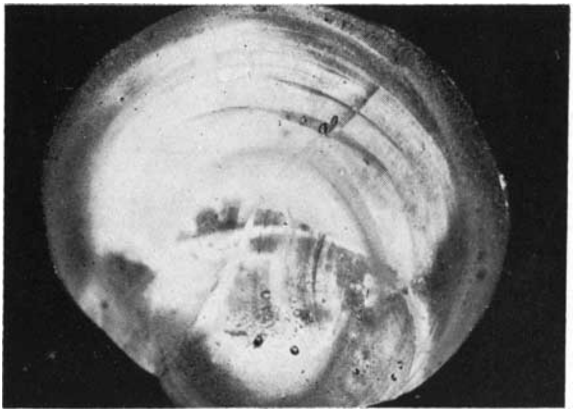


Fig. 8

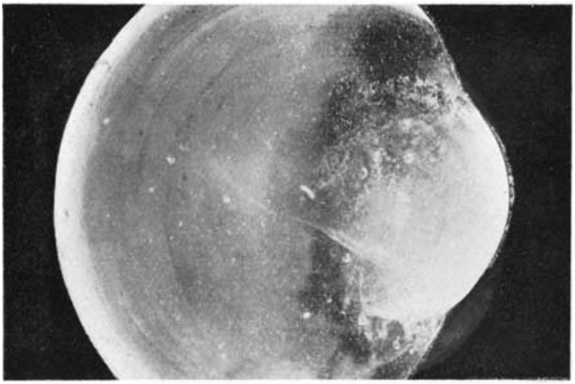
over and, as such, did not indicate that it had been attached to anything during the growing process. Considering the nature of the striations which are indicated in Fig. 8, the boule could have been attached during the initial growing formation but if so the bottom portion was fused over and rounded upon completion of the boule. The seed or nucleus from which these were started was obviously a piece of corundum formed previously by the same method.

Although these boules correspond exactly to the description of some of the first reconstructed boules, they display absolutely no inclusions which in any way resemble or indicate that natural ruby was used. Also, since they were obviously grown from powder using a piece of similar material as a seed and possess striae, bubbles, and slightly uneven colour banding resembling closely the characteristics to be found in the boule tips, it is concluded that these are nothing more than synthetic boules grown prior to the commercial application of the modern Verneuil process.

Fig. 9 shows a different focus on the same cross section revealing the numerous bubbles also present in the seed area.

In conclusion, it may be said that the presence of any great quantity of truly reconstructed rubies in the trade is still rather doubtful, and that the majority of stones which have been so identified are probably synthetics of early manufacture. Obviously, ruby fragments which are bonded with quartz fragments that in turn would become amorphous upon solidification, would show characteristics quite unlike anything described above, and could be identified by hardness tests and lack of continuity in crystallo-

Fig. 9



graphic orientation of the fragments. Also, any stone composed of sintered natural fragments will not display curved growth lines for the individual fragments as such lines can only result from artificial growth in which the material is completely melted and grown by accumulation.

Of course, as pointed out in previous publications,[2] a molten mass of natural ruby, while in a viscous state, could develop swirl lines which could be irregular and even intersecting, but there would be nothing in this type of growth to cause the development of elongated gas bubbles that would be perpendicular to the swirl lines. This is a characteristic of many stones which have been identified as reconstructed. Of course, this is not meant to imply that no reconstructed boules have been found. On the contrary, a few such boules have been reported in which some of the natural ruby from which they were grown is still intact.

However, none of the stones submitted to the laboratory as reconstructed have displayed characteristics that would indicate natural origin. Since it is now known that the characteristics of the reconstructed stone as outlined in present gemmological texts are to be found in synthetic stones, it seems only reasonable that—to avoid further confusion regarding stones cut from boule tips and similar appearing synthetics—the use of the term "reconstructed" should be confined only to stones which consist of sintered natural fragments and which, in turn, display inclusions characteristic of natural rubies.

[2] Gems and Gemology, Summer 1949, pages 184–190.

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ABSOLUTE and RELATIVE REFRACTIVE INDEX

by F. Hessling

POSSIBLY, more often than not, many who take up Gemmology have not the advantage of previous study in that branch of science known as Optics. They soon learn, either from the usual books on Gemmology or in classes, the rules and laws which cover incidence, refraction, total reflection and critical angles, all of which come under the sub-division of Optics termed "Geometrical Optics."

It is easy to grasp Snell's law—incidentally brought to its present form by Descartes—that, in its simplest form, the R.I. of a medium is the ratio of the Sines of the Incident and Refracted ray angles, or :—

$\frac{\text{Sin i}}{\text{Sin r}}$ = R.I. = a constant for any two stated media, the ray passing from the optically rare medium to the optically denser.

The diagrams or sketches in books illustrating Snell's law usually show the ray as travelling in air and incident on the medium under test into which it is refracted, i.e., from a rare to a denser medium.

Necessarily, for the purpose of having a comparative basis for gems and materials, air—it really should be a vacuum—is given the R.I. value of 1.0, and the many tabulated R.I. of gems, etc., are always on this basis. Strictly speaking, they should be termed "Absolute Refractive Indices."

Diagrams given show the reversibility of a ray, i.e., from a dense to a rare medium, and this rare medium is usually taken as air, to illustrate the "limiting angle" to refraction known as the "critical angle," beyond which "total reflection" at once commences in the denser medium in accordance with the law of reflection.

It is very easy to show that the reciprocal of a R.I. is the sine of the critical angle, and from this is strongly emphasized the principle (1) "The greater the R.I. of the denser medium, the smaller is the critical angle" or limit of refractive zone, thereby implying the reflected zone or angle is correspondingly greater.

It is this " demarcation boundary "—the critical angle—dividing the reflected (illuminated) and the refraction (unilluminated) zones which results in the " shadow edge " readings on a refractometer scale. Gemmological books emphasize this and, while they do sometimes make a more-or-less incidental reference that the rays are from a dense medium (refractometer table) to a rarer medium (stone under test), the significance of which is often missed by a student, they do not point out that the above principle (1) is " completely reversed " in a refractometer. Nothing to do with the reversing or erecting prism for the eyepiece.

The basic principle in refractometers is that of " Relative Refractive Indices " not Absolute, and this results in "The greater the R.I. of a medium under test, the greater is the critical angle and therefore the smaller is the zone of total reflection "—quite opposite to what one might have unthinkingly expected. This is shown in the normal use of refractometers in that the higher the R.I. of a medium under test (a gemstone) the less is the illuminated part of the scale.

This results from the fact that for absolute R.I. the basic unchanging medium of the two media in use is air—rarer than the test piece—whereas for relative R.I., as in a refractometer, the unchanging basic medium is the refractometer table (hemisphere or prism) which is the denser of the two media.

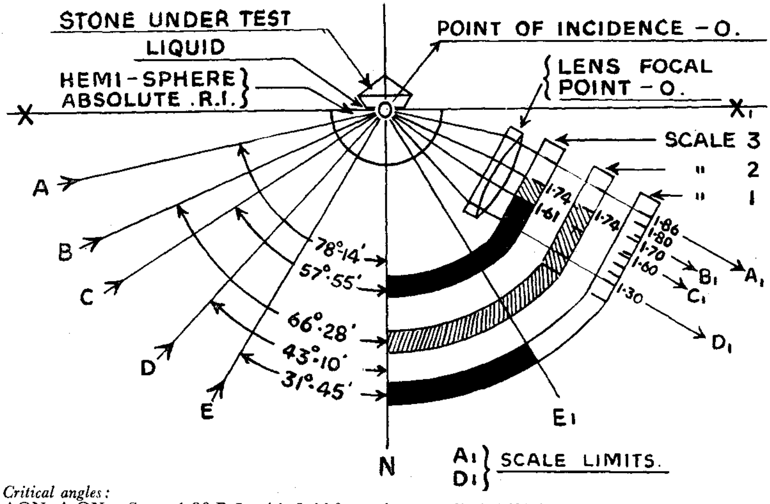
Without having grasped this fact it can be exceedingly puzzling to reconcile an accurate geometrical layout of the angular path of a ray of light for absolute R.I. of a gemstone to that very different layout of the angular path for the same gemstone through a refractometer (neglecting entirely any reversing prism), which is basically relative refraction.

It is quite simple to evaluate relative refraction. It is the simple ratio of absolute R.I. of refractometer table—not often given clearly—to the absolute R.I. of the stone under test.

E.g. : Abs. R.I. of table say 1.90 ;
,, ,, ,, Almandine 1.79 ;
1.90 : 1.79 = Relative R.I. 1.06.

As the reciprocal of this R.I. = Sin. critical angle or angle of total reflection, then

$$\frac{1}{1.06} = \frac{1.79}{1.90} = .9421 = \text{Sine of critical angle } 25'.$$



Critical angles:
AON, A_1ON, Stone 1.86 R.I. with fluid for scale upper limit 78° 14′.
DON, D_1ON, assume media 1.3 R.I. arbitrary for scale lower limit 43° 10′. This computed. Water nearest 1.33 R.I. EON, NOE$_1$ table/air alone 31°45′ (Absolute R.I.)
BON, NOB$_1$ Fluid alone 1.74 R.I. 66°28′. CON, NOC$_1$ Fluid 1.74, stone 1.61 57°55′.
Scale readings:
No. 1 Ray E. No shadow edge. Only zone NOE$_1$ dark. Reflected zone EOX$_1$ covers full scale. No reading.
No. 2 " B. Faint shadow to 1.74. R.I. of fluid.
No. 3 " C. Scale dark to 1.61, faint shadow to 1.74.
Note. For above Critical angle AON, A_1ON, the fluid must be higher than 1.86 R.I.

The difference between Absolute and Relative refraction for the same material can be enormous. The saving feature is that while a refractometer functions on relative refractivity, the scale is graduated in terms of absolute R.I.

Again, while absolute R.I. tables of gemstones and other materials must be accepted as unchangeable—air always being the one unchanging medium—tables of relative R.I. of media would vary all depending on the R.I. of the media used for refractometer hemispheres or prisms, and these do vary quite considerably in different makes of refractometers.

As an example of the differences between absolute and relative R.I. the stones below are cited :—

Assume a refractometer table of R.I. 1.90.

	Absolute R.I.		Actual Relative R.I.	
	R.I.	Crit. angle	R.I.	Crit. angle
Quartz	1.548 (average)	40° 14′	1.23	54° 34′
Almandine	1.79	33° 58′	1.06	70° 25′

The drawing further illustrates the principle outlined above.

The Craft of

DIAMOND POLISHING

by O. Holstein

THE " Craft of the diamond polisher " was originally written for the use of the practical man, and was meant to be a help to the apprentice and master. Although necessarily the stress is laid on the practical aspect it may contribute to solving some problems of the gemmologist who for the first time tries to understand the intricacies of diamond polishing.

The Diamond Polisher

Skilled labour is essential for the rational working of the diamond because of its value, its hardness and its crystallization. We speak of sawing (cleaving), bruting and polishing, all three branches of diamond working needing special skill, and the application in all three occupations necessitates three or four years' training. Only years of intensive training will result in the necessary skill, accuracy and sharp eyesight.

The technique of all stages of polishing of diamond, as in the case of no other gem, is dependent on the gem's crystallization, i.e., the structure.

As we know, the diamond is the hardest available material. All other gems which are valued because of their hardness can be ground accurately with diamond. Of course the crystallization of the stones must be taken into account but as far as the actual grinding is concerned there are no difficulties if diamond powder is used as an abrasive. This is quite different in the case of diamond itself. The hardest material can only be treated with the hardest available matter, i.e., itself. The possibility is given, but is dependent on the natural structure of the crystal and intimate knowledge of it.

Ideally the diamond is perfectly crystallized as an octahedron. Eight equilateral triangles, which themselves may have slight pyramidal elevations, form the outer limits of the crystals, to make a pyramidal octahedron (trisoctahedron). In this crystal one can imagine three equal crystal axes intersecting at right angles, thus grouping the diamond with the regular crystal system (cubic). Apart from the described ideal form, the diamond is found in many various habits. It is advisable to imagine these habits in the ideal octahedron form in order to arrive at the most effective way of polishing. The structure lines are easily visible and discernable guides to the way of polishing. Others may speak of growth stripes, of zonal structural phenomena, but the diamond worker, be he sawyer, bruter or polisher, is not concerned with them. He only knows one designation, the growth (Wuchs, waas), an international name of the trade.

The diamond is cleaved in the direction of the structure lines, the cleavage plane being parallel to an octahedral plane. In many cases sawing is preferred ; it is only possible in the direction of the axis (parallel to cube or dodecahedron planes). Polishing is, of course, also dependent on the growth, the most suitable direction being at right angles to the growth lines ; as the polishing also produces marks, these polishing marks should be at right angles to the growth lines.

Fig. 1 shows an octahedron face, or to be more exact an octahedron pyramid (three faces of a trisoctahedron).

One of the eight crystal faces, an octahedron face,

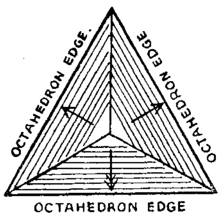


Fig. 1

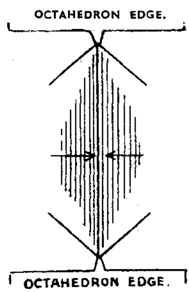


Fig. 2

The thin lines show the growth. The most advantageous polishing direction is indicated by the arrows from the pyramidal apex down to the octahedron edge. There are three possibilities which would result in three facets. But only one facet is required ; this is stipulated by the facet arrangement of the desired cut. This ideal habit is not often found in nature ; one of the three parts comprising the octahedron face is most probably prominent and occupies most of the space required for the facet. We polish, therefore, in the direction indicated by the majority of growth lines and simultaneously grind over the two other growth lines in order to obtain the one facet. It is obvious that the polishing of these two other growth directions does not proceed as smoothly as polishing in the beginning—it is much slower because the polishing direction is not the most favourable one. Because of this fact it is often said (even in textbooks) that the diamond is harder in certain spots. The suggested explanation casts doubts on this assertion. The polishing is slower in parts where we do not utilize the most favourable direction. The stone itself has no discernable hardness differences on account of structure differences.

It is well-known to all polishers that there are stones which are easier or more difficult to polish but this refers to the whole stone or only to its skin but not to certain parts of it. But even in the case of difficult polishing we cannot talk of " harder " or " softer " but have to use the expression " tough."

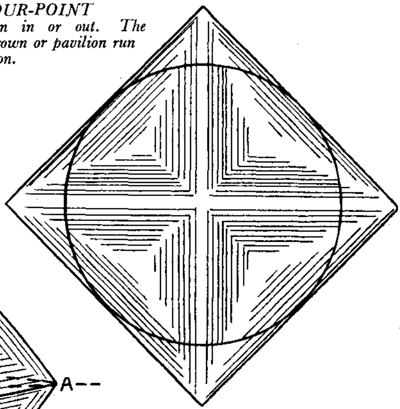
Fig. 2 shows an octahedron edge (thin lines show the growth). The most favourable directions for polishing are again shown by the black arrows. We can only use one facet on the edge for reasons already given and we have to consider the growth and polish it in the most advantageous direction. In this direction we have to grind the complete desired facet although the polishing will interfere with the growth of the other parts, and thus proceed, of course, at a slower rate.

The other drawings deal almost exclusively with the most perfect cut of the diamond, the brilliant cut ; also with fancy cuts and with the eight-cut and the 16/16. The cut of the diamond roses, called roses for short (usually cleavage pieces) is orientated according to the shown structure of the trisoctahedron; it is outmoded by the eight cut.

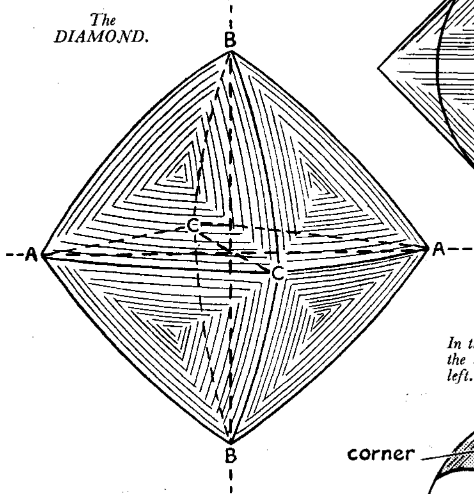
Most of the illustrations explain the structure and completion of the brilliant cut ; most diamonds are cut according to these rules. The preliminary to the brilliant cut is the eight cut. The table must be ground first, it is not only the largest of all facets but (this is most important) rules the whole rhythm of the cut.

The fundamental requirement of polishing is to utilize the given raw material most advantageously, i.e., to produce the largest possible percentage (in weight) of cut stone. Accordingly the table must be placed very carefully. There are only three possibilities

The FOUR-POINT
All corners run in or out. The four-points of crown or pavilion run in similar fashion.



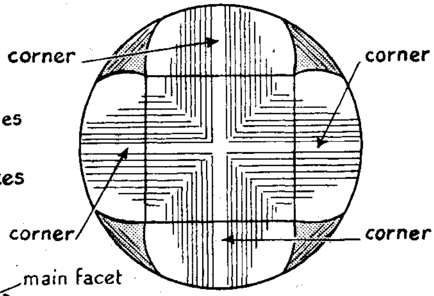
The DIAMOND.

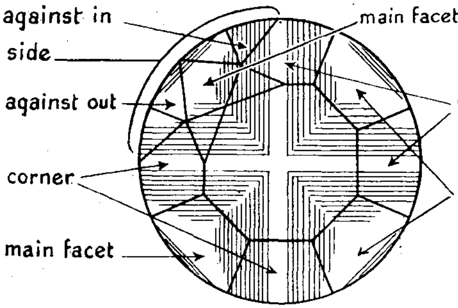


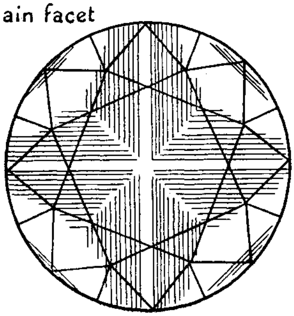
thin lines = growth lines

A-A
B-B } crystal axes
C-C

The FOUR-POINT
In the arrangement below of the table the largest main facet must be to the left.





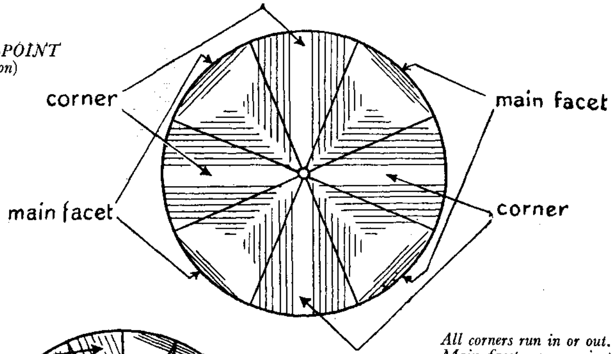


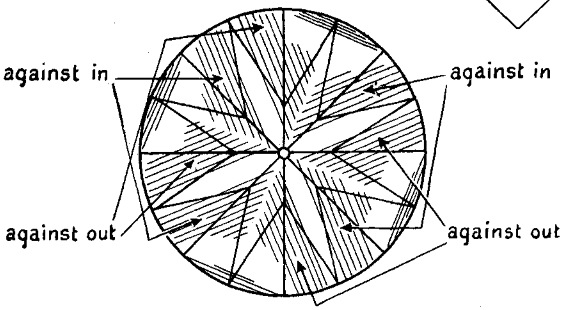
The FOUR-POINT
(Crown) *Either grind all main facets (eight cut, this is the best way) or grind one side after the other. Main facets run against in or against out, and also off.*

(Right) *The four-points of crown or pavilion run in similar fashion.*

In the illustrations the grinding directions refer to the growth lines and not to the individual facets.

The FOUR-POINT
(Pavilion)

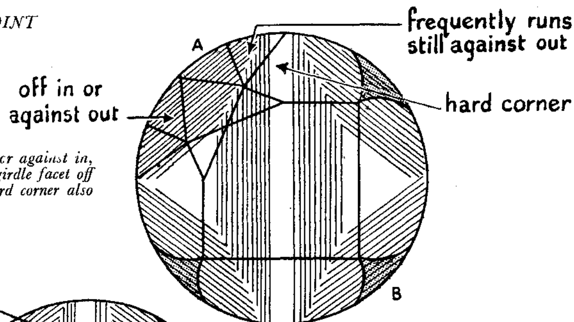




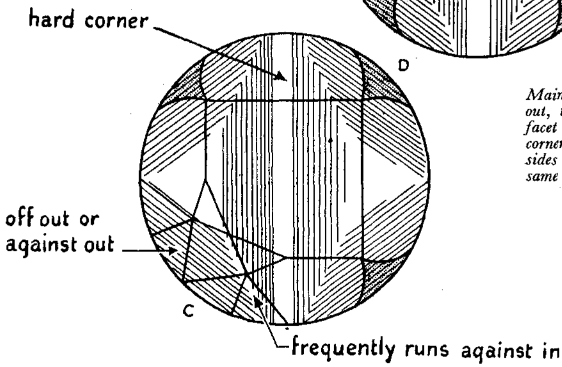
All corners run in or out. Main facets run against in or against out, on pavilion frequently off, this may be seen from the red growth lines.

The four-point of crown and pavilion run in similar fashion.

The TWO-POINT



Main facet runs off in or against in, table facet against in, girdle facet off in or against in, on hard corner also against out.



Main facet runs off out or against out, table facet against out, girdle facet off out or aganist out, on hard corner also against in. The opposite sides A and B, C and D run in the same way.

which depend on the crystallization (growth) because the growth governs always the possibilities of arranging the facets. In its own rhythm the geometric-symmetrical arrangement of the facets must harmonize with the growth, even if the outer shape of the rough diamonds deviates from the ideal octahedron.

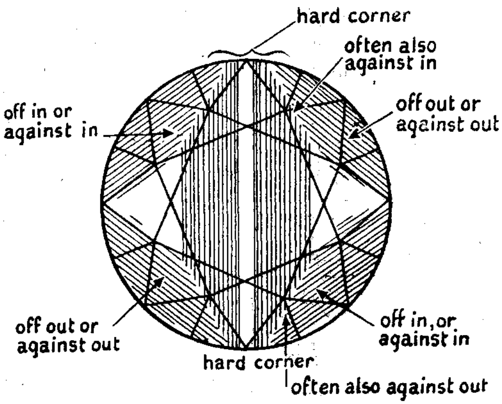
(*a*) The table of closed (round) goods must be placed in the same plane as those of sawn stones where it coincides with the sawing plane. In this position it runs parallel to two of the crystal axes and intersects the third at right angles (cube plane). In this case we speak technically of the four point. The word " point " is derived from the Dutch word " punt " and means the protruding apex (head). (Sometimes the designation one point is used instead of four point.) Looking down on to the four point we notice four corners as the name implies. Most stones are cut according to the rules of the four point. Apart from the closed and cleaved goods nearly all sawn stones belong to the four points.

(*b*) The rough stone is so flat that it can be advantageously cut only by placing the table on to a flat octahedron edge (dodecahedron plane). We speak of the two point. Looking down on to the table two protruding corners are seen. Two points are nearly always closed goods, though occasionally also cleaved stones.

(*c*) The most suitable octahedron face is chosen for the table. We call this three point. The three corners of the triangular octahedron face determine the position of the table and the size of the brilliant. The three point is nearly always a closed stone, rarely a cleaved stone. Frequently it happens that the three point is not a single crystal but consists of two crystals. These are joined on their octahedral planes and may simulate a single crystal. This is the much dreaded naat stone feared by polishers who are not thoroughly skilled. The well-versed polisher knows that the twinning plane must coincide with the girdle and that shifting must be avoided in all circumstances. If those basic laws are observed the naat stone (macle) can be polished as easily as any other diamond. The three point when a naat stone deviates from the rule. The direction of attack of the scaife is the same in the pavilion as in the crown.

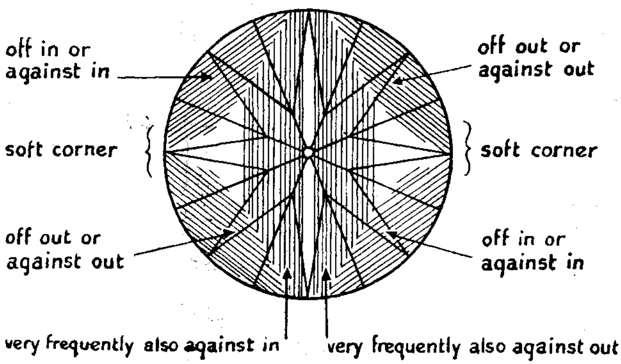
The protruding corners are removed by the bruter before polishing. The stone is bruted mostly to a round form on special machines. The bruting must be carried out with great care, some spots of the original rough stone will always remain visible so that the growth is still discernable. These growth lines and the position of the bruted parts allow the really skilled polisher to determine whether he deals with a four, three or two point. And this again tells him exactly in which direction (plane) he must polish.

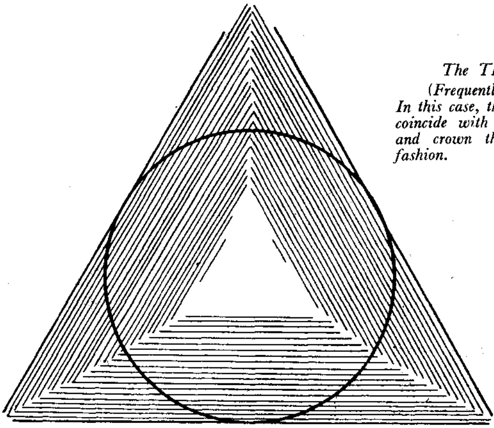
The directions of grinding or polishing refer to the position of the facet if the scaife in front of the polisher rotates from left to right (anticlockwise). If the girdle faces the rotating scaife, this spot is accordingly called " against." For the same reason the opposite position is called " off " or " running off." In the " in " and " out " positions the grinding direction runs parallel with the girdle ; in the first case the girdle faces the polisher and in the latter case the grinding spindle. Between these positions we have four additional positions, " off-in," " off-out," " against-in " and " against-out." " Off-in " lies between " off " and " in," " off-



The TWO-POINT

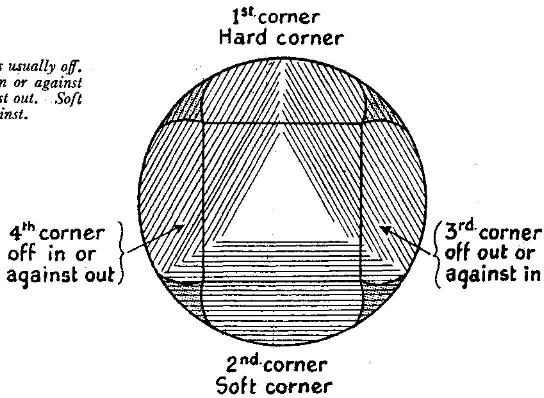
The two-point of crown or pavilion runs in the same fashion.





The THREE-POINT
(Frequently twin or "naat")
In this case, the twinning plane must coincide with the girdle ; pavilion and crown then run in the same fashion.

(Crown) *Table runs usually off. Hard Corner : off in or against in or off out or against out. Soft Corner : Off or against.*



out " between " off " and " out," " against-in " between " against " and " in," and " against-out " between " against " and " out." These designations are well chosen because they indicate the positions clearly, though some others use such terms as " left in," " left out " and so on. There occur frequently slight deviations from the mentioned positions but it would not be advisable to introduce additional designations as they would only confuse.

The diamond polisher cannot work automatically without thinking because he must constantly consider the deviation in the polishing direction on account of the growth. The dop which holds the stone is not rigidly attached to the tang because of these deviations. A copper stalk which can be easily bent connects dop and tang and allows the polisher sufficient adjustment.

In the illustration the designations " hard corner " and " soft corner " have been used. These do not refer to the hardness—they are conventional expressions, and the stone is not harder in these spots than anywhere else. However, in these spots several growth lines meet as can be seen from the thin lines. If the polisher cannot imagine the structure of the stone which he is polishing, he will only find after many trials and errors the correct grinding direction for the facet on this particular spot. Sometimes he may not find the direction at all, and the inexperienced polisher may then encounter what is for him literally a " hard corner."

The " fire," the liveliness of the polished diamond, especially of the brilliant cut depends partly on the relative dimensions of crown and pavilion; on the angle between the facets and a plane through the girdle which runs also parallel to the table, and on the size of the table itself.

The BRILLIANT and its Dimensions

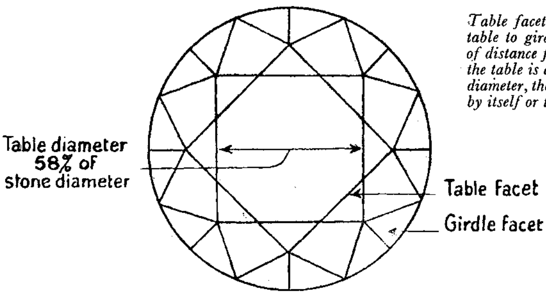
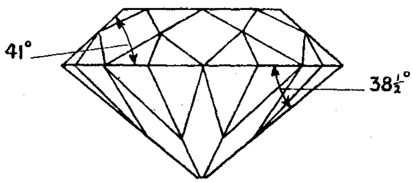
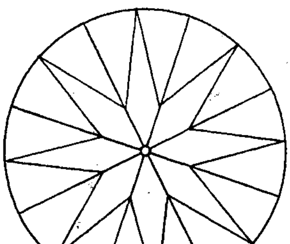


Table facets 2/5 of distance from table to girdle. Girdle facets 3/5 of distance from table to girdle. If the table is exactly 3/5 of the girdle diameter, the arrangement works out by itself or the stone is wrongly cut.



The total height is 6/10 of the diameter, larger stones are a little flatter, down to 58% of the diameter. The crown comprises 1/3 and the pavilion, 2/3 of the total height. This ratio must be strictly adhered to. The thickness of the girdle does not increase with the size of the stone, so that larger stones are somewhat flatter if the interfacial angles are the same.



Pavilion.
Girdle facets 2/3 to 3/4 of the distance from girdle to cutlet exact octagon.

Illustrations on page 22 indicate all that is necessary for the diamond polisher to know. Although made for the practical polisher they consider also the purely scientific calculations of the light refraction and reflection of the brilliant.

Refraction forms the basis of the scientific calculation relating to the light rays which enter the stone. The fire and the liveliness of the stone depend to a large extent on the amount of light which leaves the stone and meets the eye. Practical experience and science have determined the relative dimensions of the brilliant and the interfacial angles of the facets in such a way that the largest amount of light leaves the stone and meets the observer. Thus the optimum " fire " and the greatest liveliness of the stone are guaranteed.

When second-hand diamonds or badly cut stones are repolished the polishing marks on the facets give a clear indication whether it is a two- three or four-point stone. For instance, if only on two opposite large facets the polishing lines run parallel with the girdle, the stone is a two point, and so on. In any case, the experienced polisher who understands the principles of diamond polishing will always know how to proceed.

LETTER TO EDITOR

Dear Sir,

In his article in the Journal for October 1952 (Vol III, pp 320 et seq.) Mr. Norman H. Day referred to the peculiar ripple-markings of amethyst and Dr. Spencer's description of them as " thumb-prints ", quoting his article on "Quartz " in the Encyclopardia Britannica, 14th ed., (1929). Dr. Spencer's article first appeared in the 11th (1910) edition of the E.B, with a cross-reference to the article on "Amethyst" by the late F. W. Rudler (formerly curator of the Geological Museum), from which the following quotation may be of interest.

" Amethyst is composed of an irregular superposition of alternate lamellæ of right-handed and left-handed quartz . . . In consequence of this composite formation, amethyst is apt to break with a rippled fracture, or to show " thumb-markings ", and the intersection of two sets of curved ripples may produce in the fractured surface a pattern something like " engine-turning ". Some mineralogists, following Sir D. Brewster, apply the name of amethyst to all quartz which exhibits this structure, regardless of its colour."

Yours faithfully,

J. R. H. CHISHOLM.

The Royal Institution,
21, Albemarle Street, London, W.1.

NOTAE—UT INFRA

by D. S. M. Field, A.G.A.

IN addition to the scapolite reported in the last issue, two other deposits of interesting Canadian gem minerals came to light during 1952.

Near the village of Tory Hill, Monmouth County, Ontario, a mineral collector reportedly uncovered a large pocket of dark brown to black sphene crystals of large size. The crystals were found in a fissure vein of which the middle portion had been blasted out more than twenty-five years ago by prospectors in search of economic minerals. It is the collector's opinion that many more large crystals exist in the portions of the vein left intact, and work is now in progress on the deposit.

The writer has two fragments chipped from Canadian sphene crystals, and these appear to be of fine gem quality—perfectly transparent and with very pronounced adamantine lustre. One of the fragments is rich golden brown and the other is almandine red in colour.

Many of the so-called " black " crystals found in Canada are of very large size, and might yield quite attractive gems if the flawless portions were reduced to cutting size. It is quite evident that the richly coloured thin fragments mentioned above were removed from crystals that appeared black or brownish black in their natural state.

* * *

For many years, small deposits of kyanite of little commercial importance have been known to exist in Canada. Indeed, collectors have cut and polished the occasional piece of gem quality material—carefully selected from the relatively large impure masses of crystals of industrial grade.

The possibility of securing larger and better crystals of the unusual gemstone was recently considerably heightened by the discovery of what has been termed " huge deposits " near Mattawa, in the eastern part of Ontario.

M. F. Goudge, Chief of the Federal Industrial Minerals Division, The Department of Mines, stated that the highly prized mineral was uncovered after a Department engineer came across traces of the kyanite while examining a rock sample submitted by a geologist prospecting for graphite. It has been estimated that the deposits run into " millions of tons."

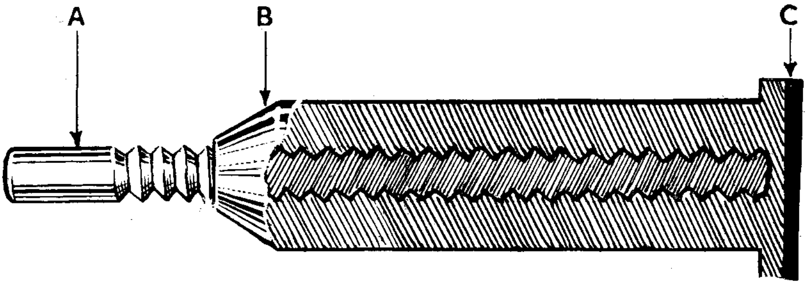
Kyanite, an aluminium silicate, is a relatively scarce, heat-resistant mineral that, when powdered, is used industrially in bricks and concrete lining furnaces and various types of thermal apparatus. As a strategic mineral, it is indispensable as a coating for jet-engine exhausts.

It is expected that when the new deposits are fully developed they will enable Canada to cut down on expensive imports of the mineral, which she currently gets from India and other foreign sources.

Extensive mining will commence as soon as the Department completes preliminary research work on economical extraction methods.

As a gemstone, kyanite is unusual for two reasons : it is chemically the same as two other rare gemstones, andalusite and fibrolite, the formula for all three being Al_2SiO_5 : and it is unique among minerals in having a hardness that varies from 4, longitudinally, to 7, across the crystal. The colour of the finest specimens is bright sapphire blue.

* * *



The accompanying figure is a schematic drawing of a retardation screw designed by the writer to permit free focusing of the microscope in either direction without risk of damage to the objective lenses or stone under test.

The accessory consists of a two-inch shaft (A), $\frac{1}{8}''$ in diameter, coarsely threaded from its tip to within $\frac{1}{4}''$ of the top, and a similarly threaded milled cap-stop (B) $1\frac{1}{2}''$ long and $\frac{3}{8}''$ in diameter.

The retardation screw is readily attached to any standard microscope, without disfiguration, by the simple process of slipping the upper end into a shallow ($\frac{1}{4}''$ deep) hole—drilled just in front of the lower end of the rack of the coarse adjustment.

The screw, when in place, acts as an adjustable stop, preventing the lowering of the body tube below the required focus.

Before examining a parcel of stones, it is only necessary to set the cap-stop so that the tip of the objective lens is arrested before it can strike the highest point of the deepest cut stone in the parcel. (Or, if immersion liquid is used, the surface of the liquid). The examiner is then completely free to focus upwards or downwards, without frequent sidewise observations or fear of doing injury to either stone or glass.

The lower surface of the cap-stop should be cushioned with black suede leather or some similar soft lint-free material, to prevent marking the microscope stage.

* * *

The editors of *Life* have published a short description* of an ultrasonic carving and drilling machine for hard materials that has been developed by an American firm† in Long Island City, New York.

Known as the *Cavitron,* the apparatus ingeniously utilizes ultrasonic vibrations in combination with ordinary abrasives to push soft steel, brass, etc., through such relatively hard materials as glass and corundum.

Vibrating at the rate of 27,000 times per second, the tip of the cutting tool is in effect a miniature trip hammer that, pounding the hard abrasive against the material, chips off microscopic particles at a high rate of speed. The shape of the cutting bit is of little importance. Indeed, accompanying photographs show an ordinary corkscrew winding its way through a large solid block of glass, and metal rings and rods sunk into a large piece of synthetic ruby.

The Cavitron is said to cut more rapidly and cheaply than other known apparatus ; and since the machine can cut cavities of intricate shapes as readily as the conventional drill can drill a straight drill hole, it should find wide application in industry and the arts.

Already the machine is in experimental use by manufacturers of delicately carved jewels and radio and aircraft parts.

* *Life,* Nov. 3, 1952—P. 97 et seq.

† The Cavitron Equipment Corporation

COLOUR FILTER EXPERIMENTS

by L. C. Trumper, B.Sc., F.G.A.

Blue Stones

SUCCESS in the development of a filter capable of identifying ruby and of separating this stone with reasonable certainty from any other red stone, encouraged me to find out if a filter could be developed or devised for the rapid identification of blue sapphires or their separation from other stones of similar appearance including paste.

First of all, I searched carefully through my collection of gemstones and from it selected a batch of stones, all of which could be mistaken for blue sapphire, particularly if seen by themselves.

The stones selected were as follows :—

A Burma sapphire of the finest deep cornflower blue colour, a Kashmir sapphire with that distinctive rich deep blue glow, another Burma sapphire of rather more royal blue colour, a deep blue benitoite, two deep blue spinels of rich colour, one having a slight tinge of green, three cobalt blue paste stones, a deep blue tourmaline, very close to blue sapphire in general appearance, an Indicolite tourmaline having a slightly greenish tinge and a blue garnet-topped doublet.

These stones were then arranged upon the tray of the expermental filter viewing box as already fully described in the Journal of Gemmology for October 1951, Volume 3, No. 4, page 153.

As before, filter after filter was then tried and whenever any appreciable reaction was observed in any of the stones under examination, this was carefully noted and the following records were accumulated :—

FILTER (Wratten)	OBSERVATIONS
RU64 (Ruby with Wratten Filter No. 64)	Sapphires remained unaltered but one blue spinel appeared more greenish.
3 Aero 1	Sky blue tourmaline and the Indicolite tourmaline became distinctly green.

FILTER (Wratten)	OBSERVATIONS
No. 8 K 2.	The tourmalines showed distinctly green as also did one of the cobalt pastes.
12 Minus blue.	All stones greenish except the benitoite which showed somewhat greyish.
22 E 2.	Tourmalines greenish, the cobalt pastes slightly greenish, remainder all brownish.
30 Rose Bengal.	All stones violet except the tourmalines which remain greenish. The blue sapphires however show a much more pronounced violet colour.
32 A Minus green 3.	Benitoite mauve, the remainder deep sapphire blue in colour.
46 Blue.	Spinels very slightly greenish ; remainder blue.
89 A Signalling red, dark.	One cobalt paste becomes colourless, the other stones remain dark.
97 Dichroic Filter.	One paste showed distinctly red, the others pinkish and the remainder blue.

Combinations of various filters were then tried, careful observations were again made and the following results were obtained :—

30 Rose Bengal with 3 Aero 1 superimposed.	Sapphires violet/purple, tourmalines green, remainder blackish yellow to brown.
30 Rose Bengal and 22 E 2 superimposed on the left eye and 31 Minus green 1 and 3 Aero 1 superimposed on the right eye.	The combined result was that sapphires showed a tinge of violet alone—other stones tourmalines and pastes greenish, remainder dirty brownish.
30 Rose Bengal and 85 very pale yellow superimposed.	Sapphires violetish, rest brown or greenish except a garnet-topped doublet which was also violet-coloured as well as one paste.
68 Fast green blue shade with 22 E 2 superimposed.	Similar to the Chelsea Filter in its general effect. Tourmalines green,

FILTER (Wratten)	OBSERVATIONS
	one paste distinctly red, the other pastes reddish ; other stones black, spinel reddish and the garnet-topped doublet reddish.
30 and 11 X 1.	The garnet-topped doublet looked greenish ; the rest dark brownish.
30 and 13 X 2.	Very similar to above.
30 and 102 Photo cell compensating.	The garnet-topped doublet greenish, sapphires and spinels brownish to black, tourmalines greenish. Separation of garnet doublet better than with 30 and 11 X 1.
30 Rose Bengal and 7 K $1\frac{1}{2}$	Sapphires tinged with violet, tourmalines greenish, garnet doublet bluish, pastes bluish to black.
30 Rose Bengal, 64 and K 1.	The nett result of these filters was similar to white light in appearance, the combined filter passing narrow balanced lines throughout the spectrum—of no help here.

From these experiments, it seemed that the best line of approach to a final filter was to try and bring out the predominant violet tinge present in the sapphire, which colour is less dominant in the other stones under examination.

An attempt was made to obtain from Oberstein filters of synthetic blue sapphire to try both alone and with other filters superimposed but it was not found possible to obtain satisfactory depth of colour in the synthetic material obtained from that source though it must be stated that even using the material on edge to secure the maximum depth, no very startling results were secured.

A small number of Ilford Filters were tried in addition to the entire Wratten range of filters together with a number of Omag filters.

The combination of filters which on the whole seemed to be most promising were the 30 Rose Bengal together with the No. 85 Yellowish filter superimposed.

Using this filter, considerable care is necessary and as much experience as possible, for the changes in some cases are very difficult to detect. It must also be fully appreciated that many good sapphires of deep colour even Burma ones are frequently too dark to enable the filters to bring out sufficient colour for identification purposes.

The colour changes with this 30 and 85 Filter are that sapphires appear violet or violetish if they are not too dark. Garnet-topped doublets and most blue pastes do so also, but they can be eliminated with a preliminary run over with the Chelsea filter in which they show reddish. Similarly many if not most blue spinels show a dirty reddish appearance under the Chelsea filter. Tourmaline appears greenish.

Pale Blue Stones

Further experiments were then conducted on a selection of pale to very pale blue stones. The following were chosen from among my collection for this purpose :—

Aquamarine, pale blue topaz, blue apatite from Burma, Euclase, blue beryl from Madagascar, Tourmaline of sky blue colour, pale blue Zircon, pale blue Spinel, pale blue Fluor and another shade of blue spinel.

These stones when together look so much alike that picking out any particular stone, except possibly the tourmaline, became little short of guesswork.

The following filters were tried singly and the results are recorded, as before, as being those which gave a reasonably distinct colour change :—

FILTER	OBSERVATIONS
Chelsea Filter.	Again, this filter is most useful for a preliminary survey. The aquamarine and blue beryl at once take on that distinctive apple-green colour. The euclase, particularly if of greenish tinge, showed reddish and the blue fluor pinkish ; the spinel tended towards a dark dirty pinkish colour and both it and the tourmaline appeared much darker. The blue apatite had a slightly greenish blue.
4 Kodak colour filter.	Tourmaline distinctly emerald-green.
5 Aero 2.	Tourmaline distinctly green.

Filter	Observations
16 Flavazine T.	Spinel brownish, tourmaline green, fluor pinkish, remainder pale green.
21 Monobromofluorescein.	Very similar to above.
32 A Minus green 3.	Tourmaline peacock blue, rest pale blue.
49 a C 4 light.	Spinel and tourmaline dark green ; rest paler blue.
65 Minus red 3.	Tourmaline and spinel slaty grey ; rest colourless.
97 Dichroic filter.	Zircon, topaz, fluor, euclase more or less colourless. Aquamarine and beryl and tourmaline peacock blue ; spinel brownish, apatite bluish.

Again, combinations of filters were then tried and any useful observations recorded as below :—

Filters	Observations
30 Rose Bengal and 85 Yellowish.	Tourmaline dark green, spinel dark brownish, pale blue fluor pinkish; remainder appear as if they were colourless.
34 D (Light) and 33 Xylene red.	Tourmaline deep royal blue, remainder greyish or just tinged violetish or colourless.
30 Rose Bengal and 34 A.	Almost identical results to the above.
40 Cine Green and 34 A.	Aquamarine, blue beryl and tourmaline appeared bright peacock blue, fluor pink, euclase pink, apatite greyish blue, zircon colourless, topaz greyish to colourless, spinel dark neutral tint or reddish.
68 Fast green blue and 22 E 2.	This Filter is very similar in its reactions to the Chelsea Filter, but is more sensitive with pale shades, giving deeper colour changes. It has, however, a residual flesh tint which can be confusing unless care is taken. The aquamarine and blue beryl showed a distinct deep apple-green, zircon and topaz colourless, spinel

showed a deep reddish tinge, euclase and fluor distinctly red, tourmaline dark green, apatite greyish green and iolite purplish blue. Very pale blue spinel shows pale plum red or purplish. Mauve spinel distinctly reddish.

Further consideration was then given to the whole problem of blue stones, whether pale or similar to blue sapphire, whether of light or dark shade and the conclusion reached was that from the experiments so far conducted, the best selection for both light and deep blue stones for addition as a separate disc to the Interchangable filter viewing Box as described on page 156 of Volume 3 of the Journal previously referred to, were the four pairs of filters, being one pair each of the filters set out below together with a note of the principal reactions :—

Filter	Observations
1. Chelsea Filter.	Aquamarine and blue beryl appeared distinct apple green. Garnet-topped doublets and some paste appeared reddish ; spinel dirty pink or reddish; euclase and fluor pinkish.
2. 68 Fast Green blue and 22 E 2.	Similar to the above, but more sensitive in the paler shades. The filter has a residual flesh tint and the use of a colourless neutral stone such as a Quartz as a control is recommended.
3. 30 Rose Bengal and 85 Yellowish.	Sapphires appeared violet-coloured ; blue fluor pinkish.
4. 30 Rose Bengal and 34 A.	Tourmaline appeared a deep sapphire blue.

By means of these filters, reasonably certain differentiation can be secured with practice, but their principal use lies more in the rapidity with which a parcel of stones can be examined and stones which show a radical colour change can be quickly extracted for more critical examination.

Again if the colour change is not what was anticipated one is at once put upon one 's guard and a possible blunder prevented.

Further experiments will be made as time permits.

Gemmological Abstracts

CREMER (E.). *Die Deutsche Edelstein-und Diamantenindustrie in Zahlen.* German precious stone and diamond industry. Gold und Silber 5, 1952 (No. 9/10), pp. 10, 11.

New statistical material from 1949 onwards is available for the Idar-Oberstein district only. Therefore, the author has based his investigations on the year 1937 when employment was considered normal in the whole cutting industry. In spite of the time lapse and of war and post-war influences, the figures convey a valid message, especially as war damage to cutting plants was not significant. The total export of precious stones, pearls, synthetics, technical stones and diamond contract work amounted to two million £ sterling. From a total of 1902 firms employing 8,876 workers (70% of the capacity), the biggest group consisted of 722 diamond polishing plants employing 6,484 workers (80% of the capacity). Firms employing less than five workers were in the majority in all groups, amounting to

86% of the precious stone cutting shops,
96% of the agate cutting shops,
92% of the engraving shops, and
52% of the diamond polishing shops.

Over 50 workers were employed in one precious stone cutting factory, in one agate cutting factory, and in 11 diamond polishing factories. The important centres were Idar-Oberstein with 91% of the precious stone cutters and 39% of the diamond polishers; Hanau with 29% of the diamond polishers; and the Palatinate with 31% of the diamond workers whose orders came mostly from Idar-Oberstein and Hanau.

E.S.

ANON. *Diamond hunting in the jungle.* Gemmologist. Vol. XXI, No. 254, pp. 158–163. Sept. 1952.

An account of the prospecting for diamonds in the jungle of Ouganbui-Chari, French Equatorial Africa. Primitive apparatus is used for the recovery of diamonds which are in the sub-soil of ancient river beds several feet below the underbush. 135,000 carats of diamonds were mined during 1950. 4 illus.

R. W.

Payne (C. J.). *Sinhalite—a new mineral and gemstone.* Gemmologist, Vol. XXI, No. 255, pp. 177–181. Oct. 1952.

An account of the identification of the gem mineral which was for many years considered to be an iron-rich peridot. A table is given of the physical and optical constants of 24 sinhalites examined by the workers who identified the mineral (Dr. Claringbull *et al*). Little further information than given by Anderson in Volume III, No. 8, of the Journ. Gemmology.

R. W.

Gordienko (M.). *Polishing precious stones in the U.S.S.R.* Gemmologist, Vol. XXI, No. 255, pp. 181–182. Oct. 1952. (*Reprinted from the Diamond Worker*).

The author is the Chief engineer of the Moscow Jewellery and Diamond Polishing Works. Stone polishing in Russia dates back to the 17th century. Some 1500 skilled lapidaries were employed in the Urals during the 17th–18th centuries and during the latter part of this period a school was opened in order to train staff. Up till 1924 ordinary hand or treadle wheels were operated. Mechanisation started then and is now almost universal except for important stones which are still cut on the old type wheels in order to save weight. The lapidary's work is regarded as of great importance in the U.S.S.R., and the vocational schools in Leningrad and Sverdlovsk have special departments where young stone polishers are trained, and in addition, because Soviet industries are badly in need of lapidaries, youngsters are trained individually in the factories. Women are also employed in diamond cutting.

R. W.

Robb (C. J.). *Irish jade.* Gemmologist, Vol. XXI, No. 255, p. 195. October 1952.

The existence of ancient Irish jewellery set with jade and the finding of jade celts supposes that jade had been found in Ireland. While tremolite is found in some of the metamorphic rocks, a source of jade has not yet been found.

R. W.

Frondel (C.). *Effect of heat on the colour of beryl.* Gemmologist, Vol. XXI, No. 256, pp. 197–200. November, 1952.

Observations on the colour change in the species beryl upon heat treatment, and a report on heating experiments carried out at Harvard University, Cambridge, Mass., U.S.A. Controlled heating at temperatures between 100° and 1025° C. on some 23 beryls of different colours and from different localities were carried out. Parallel experiments on a number of beryls of various shades of green heated to 405° C. were carried out in order to corelate the depth of the original colour to the depth of the induced colour. Emerald was found to be stable up to 1025° C. (the limiting temperature used in the experiments). Manganese coloured raspberry-red beryl from Utah was also found to be stable up to this temperature. Morganite was found to bleach slightly at 440° C. and to rapidly decolour at 495° C. Golden beryl becomes completely colourless after 10 hours heating at 250° C. and fairly rapidly at 300° C. Greenish-yellow, olive green and yellowish-green beryls lose their yellow component between 250° C. and 280° C., leaving a clear green coloured stone which on further heating to about 300° C. turns blue, an effect common to all green beryls tested. The blue colour, which is proportional to the depth of the original green colour, appearing between the temperatures of 280° to 300° C., and takes place in a few minutes when the temperature is over 400° C The blue colour is then stable to 1025° C., the highest temperature used in the experiments. X-ray experiments on unheated and heated beryls, using a tube with a copper target and running at 40kV and 15mA, produced no change of colour. A green beryl irradiated with deuterons from a cyclotron became turbid through cracks developing owing to the high temperature generated during the experiment. A number of theories on the coloration of beryls are given. 12 references.

W.B.

Zeitschrift der Deutschen Gesellschaft fur Edelsteinkunde. Autumn, 1952, No. 1.

The official journal of the newly formed Gemmological Institute at Idar-Oberstein, edited by Prof. K. Schlossmacher.

SALLER (X.). *Zuchtperlen mit Glaskern.* Cultured pearls with a glass core. Zeitschr. Deutsch. Gessell. f. Edelsteinkunde. Autumn, 1952, No. 1, pp. 17–18.

Report on alleged discovery of pair of (Australian) cultured pearls with glass core.

E.S.

Notices of Books

PHYSICAL GEMMOLOGY. Walton (Sir James). 304 pp., 400 illus. Sir Isaac Pitman & Sons Ltd., London, 1952. Price 30s.

The modern concepts of physical science demand an understanding of the structure of the atom. Walton realized this and commenced his book with a detailed description of the past and present atomic theories. The atomic and molecular packing and its relation to crystal structure is clearly discussed and elaborated by some details of the methods of X-ray crystal analysis.

The chapter on crystallography is particularly notable in that it caters for the student gemmologist who may not be well versed in mathematics. Cleraly expressed text and line drawings tell all that the gemmologist needs to know of this subject. A short concise chapter on geology, usually omitted from gemstone literature, fills a valuable niche.

The chapter on *The microscopic characters of minerals* starts with a short discourse on the use of the compound microscope. This is followed by very full description of the various inclusions seen in natural, artificial and imitation gemstones, and illustrated by over 120 pen and ink sketches. The usual theories of light are given as an introduction to the chapter on the optical characters of minerals. An unexpected, but useful, contribution are notes on the path of light rays from curved mirrors and through lenses. The varieties of refraction are explained and the various methods employed for the measurement of refractive index discussed. This is followed by an explanation of diffraction and polarization of light and the use of the polarising microscope.

Colour is wisely given a chapter to itself, for colour is so important in gemstones and in gemstone testing. The causes of colour are discussed, with particular emphasis on Weyl's theory that the cause is due to unsaturated fields of electrical or chemical force. The chapter continues with an explanation of dichroism and the dichroscope, the spectroscope and their types, and the kinds of spectra. The absorption spectra of gemstones are treated at length in the text and are well illustrated by line drawings. The employment of the polarising microscope in interpreting the sign of birefringent stones by analysing the interference effects in convergent polarised light is discussed, and the chapter concludes with some short notes on luminescent phenomena.

The problems of specific gravity are discussed and the various methods used are explained fully ; included are notes on the special apparatus devised by the author of the book. Hardness, cohesion, fracture and cleavage are well explained and the chapter concludes with notes on magnetic, electrical and radio-active characters.

The volume contains no descriptions of the gem materials, an omission in keeping with the title of the book. It is surprising to find that the last chapter is devoted to the fashioning of gem materials. It is a well written chapter but seems " lost " and outside the scope of the book and could have been omitted without detriment.

There are a few errors which could be corrected in future editions, but they are of small consequence. Some confusion seems to be shown in the notes on dispersion; high birefringence gives two separate dispersions but is not essential to produce " fire," anyway both diamond and blende are singly refractive. Under allochromatic coloration ; the inclusion of the manganese and copper minerals, rhodonite and rhodochroisite and malachite, is surely incorrect. They too, with peridot, are included under the idiochromatic group on the preceding page. Although it is quite true to say that the dispersion of a prism spectroscope is more drawn out at the violet end, it is a moot point as to whether such a widening assists observation at that end. The bands or lines are themselves spread out and are thus more diffuse and are seen less sharply. The great number of line drawings which illustrate the book are beautifully clear. Some criticism may, perhaps, be levelled at the perspective used in drawing some of the crystals which tend to a distorted form.

The volume has an appendix listing books for further reading and is completed with a good index. The type selected makes for clear and easy reading and the printing is done on good paper. The book is attractively and durably bound in grey linen. The volume is a valuable contribution to gemmology.

R. W.

SOUTH AFRICAN DIAMOND MINES REVISITED

WHOEVER is interested in diamonds from a technical point of view, may feel that he cannot obtain accurate enough information through reading books, seeing films and talking to people, but that he may have to go personally to those distant parts of the globe, where this particular mineral is found. Mr. P. Grodzinski, Head of the Industrial Diamond Information Bureau was fortunate enough to make this journey for the second time in five years, and the following account is based on this journey to the world's most important diamond producing centres. Here are some of his impressions, gained when visiting the lands of diamonds, which he gave to members at a meeting held on Thursday, 20th November, 1952.

1. *The Premier Mines.* During the first visit he had to walk underground down an inclined haulage way until about the bottom of the Big Hole, which is almost 600 ft. below the surface. At that time there existed practically no recovery plants and it was not yet decided in which way the mine should be operated and what plants would have to be set up. To-day the situation has changed completely. The Premier Mine is not only the largest, but also the most modern diamond mine in the world. Its plants can treat four million tons per year and the present rate of production is over one million carat of diamond annually from which about 80% are industrial. Before the Premier Mine was closed down in 1932, having been in operation since 1902, it had been worked to a depth of 610 ft. by opencast mining methods. The Kimberlite pipe is 3000 ft. long and 1500 ft. wide, surrounded by a red micro-granite called felsite. The present underground mining is of the most interesting type and all mining engineers are full of praise for the ingenious methods which are being applied. A cut 200 ft. deep and 24 ft. wide was made across the full length of the pipe. Horizontal gangways in 50 ft. vertical distance are driven towards the slot and upholes are driven fanwise by rotary machines equipped with sintered carbide drill bits. The distance between every ring is 6 ft. and the rock is directly blasted into the slot. Working is in retreat so that no risks of accident exist.

The blueground of this mine is quite strong and has been exposed to the weathering, therefore relatively wide gangways can be built without timber support. The broken ground is driven off through cones at the bottom of the slot and passed through finger raises and an orepass to the 890 ft. level where the ground is transferred by 8-ton self-tipping cars into another orepass feeding the main haulage on the 1060 ft. level. Here the ground is loaded through compressed air operated loading boxes into trains of 180 cubic ft. or trucks drawn by electric locomotives to the main shaft, about 1200 ft. from the periphery of the pipe. The cars are automatically tipped at the ramps. The 8 in. oversize material is fed into an underground jaw crusher. The smaller than 6 in. production joins the undersize. A single 2500-h.p. Ward Leonard hoist brings two 12-ton skips from a depth of 1350 ft. in 52 secs. With an operation time of 20 hours per day 12,800 tons are brought to the surface. The treatment plant uses the most recent technical developments such as heavy media separation and vibrating grease tables as well as an electrostatic separator. Formally the yield was 17 ct. per 100 loads but with the present plants the yield is much higher. The new methods have reduced native labour by 57% and European labour by 11% for the same tonnage.

2. *Kimberley District.* During the first visit only two diamond mines were operating : the Bultfontein mine and the Dutoitspan mine. The situation has changed in so far as now the Dutoitspan mine and the Wesselton mine are operating whilst the Bultfontein mine is being refitted and exploration work is going on in other mines such as the De Beers mine, the Kooffiefontein and Jagersfontein mines. All these mines have before worked opencast but have now passed over to underground operation. As a matter of fact, with minor variations, the mining system is in general the same. Unlike the Kimberley and the Premier mine the blueground of Kimberley is relatively brittle and the underground gangways have to be kept relatively small and wooden supports are necessary. In addition, the blueground disintegrates rapidly when coming into contact with water and all drilling of blueground in the Kimberley mines, including long diamond drill holes, has to be done dry with suitable dust extractors. When exposed to air for longer time the blueground disintegrates rapidly and this was used for the very first extraction methods by placing the blueground containing the

diamonds on open fields ; the diamonds were picked out later by hand. With these primitive methods carried out till the end of the last century probably only a fraction of the diamonds were recovered and in future one point of the development programme will be to rework these " tailings."

The mining methods used are the following : sublevels are driven 25 to 50 ft. apart and on each level a slot or chamber 10 to 14 ft. wide and extending vertically to the level above is cut from one side of the pipe to the other. When such a slot or chamber has been completed, another is cut parallel to it, leaving a pillar 6 to 10 ft. wide between the two. This crushes down fairly quickly due to the weight of the broken ground above. Loading of the broken ground is by hand from tunnels of a centre distance of about 22 ft. 6 ins. running at right angles to the chamber lines into trucks which are pushed by natives. The ore passes are usually in country rock. One of the reasons for using small trucks is obviously the fragile nature of the blueground and, of course, also the cheap native labour abundantly available when the mining system was planned. The broken ground from a number of levels is brought to a collecting level below where endless rope haulage or more recently, conveyor belts, bring the blueground to the main shaft bin. The main hoisting shaft is set at a distance from the pipe in the country rock. 6000 loads (4800 tons) are brought up per 8-hour shift. On the surface the oversize material passes over sorting belts to the jaw crushers.

The material broken to a size less than 1 in. is fed directly into rotary pans with revolving radial rakes. A so-called mud puddle of specific gravity 1.8 separates diamonds and heavy mineral from lighter Kimberlite gangue. Tailings from the pans go through rolls with a $\frac{3}{8}$ in. gap and then to secondary or fine pans through $\frac{3}{8}$ in. screens, the oversize being returned to the coarser pans. Concentrates from both the fine and coarse pans are taken in trucks drawn by locomotives to the somewhat distant pulsator plant. Here further concentration is obtained through pulsating jigs ; the final concentrate is then passed over side-shaking grease tables. The pulsating jigs consist of a pulsating screen of about $\frac{3}{8}$ in. openings over which a bed of coarse gravel about 4 in. thickness is placed. The small size gravel is placed over these jigs, whereby the lighter material is carried away with the water, whereas the heavier material, i.e., diamonds and accompanying minerals are brought to the grease tables covered with a thick layer of petroleum jelly (vaseline), and are periodically cleaned. The diamond being water repellant adheres whereas the other minerals pass over the tables. Periodically grease and diamonds adhering to it are scraped off. The grease is boiled off and the larger concentrates are hand-sorted. This technique established in about 1908 is now being modified. It is intended to eliminate the pulsator plant and to concentrate the material in a small heavy media separation plant and pass the concentrates over vibrating grease tables. This new type of grease table has already been installed at the Premier mine. They consist of small steps only about 6 in. wide and the concentrates pass over them extremely quickly.

Ultimately finer diamonds will be recovered by electrostatic separation. When this is achieved the pulsator plant will be used for reclaiming diamonds from the tailings. Actually it is already partly used for the purpose with good results.

The greatest attraction of Kimberley is the so-called Big Hole. The old mine which was worked opencast until the 90's of last century became too dangerous and a vertical shaft was driven down. The mine was operated successfully until 1908 when a big fire broke out after which the mine was filled up with water and had to be given up. The total depth of the hole is 1000 ft. and it is filled up to a 845 ft. level with water. It is a custom that a native boy throws a boulder down and one hears it splashing into the water. It is a pitiful thought that Kimberley and its surroundings suffer usually from a drought whilst plenty of water is collected in the Big Hole, the water level increasing there per year by about 2 ft. Probably pumping out of the water would not be an economic proposition owing to the lack of fuel in this district.

The other big attraction is the Consolidated Building, i.e., the building where the diamond sorting is done. It occurred that the sorting in Kimberley seemed to be a much easier task than elsewhere as here it is so very much brighter and the sun shines more brilliantly. Interesting collections of diamonds, in particular rare shapes are shown at the mine's sorting office ; pieces of blue-ground are on display in which relatively large diamonds are embedded.

Much related to the mines are the De Beers dog kennels where well-trained Alsatian dogs are kept, who watch the mining grounds during the night. It is worth while to see a performance of these extremely well-trained dogs jumping through rings 9 ft. apart and climbing up a vertical wall 10 ft. high. Hitherto no intruders have dared to cross the path of these dogs. A visit to the native compound is well worth the time, if one wants to gain an impression of their living conditions.

3. *Alluvial Diggings.* Probably the most romantic aspect of diamond mining are the alluvial diggings. Two years ago De Beers Consolidated Mines opened a large area for individual diggers at the Noiitgedacht Farm about 18 miles north of Kimberley. The director of the alluvial diggings, Col. Ormiston, allowed Mr. Grodzinski to accompany him on one of his visits to this property. 13½ miles were covered on an absolutely straight macadam road. Then suddenly the road turned to the right, directly into the " field," on a path which one could hardly call a road. It was winding through the bush and the car rocked in all directions. They came to a fence and a kind of door with a very long inscription forbidding the entrance and threatening trespassers with fines. Mr. Grodzinski passed some herds of cows and ultimately saw big water reservoirs on steel structures from which tanks on motor cars or donkey carts were filled with water. In the distance was a camp of native huts of a most shabby nature. Eventually some corrugated steel sheds were reached. These were the De Beers offices at Noiitgedacht. De Beers offices acquired the ground many years ago. The farmer before in possession carried out some diamond diggings and the efforts of his works, changing the grassland into molehills of red earth could still be seen. The main difficulty was lack of water and he could not exploit his property neither for diamonds nor agricultural purposes. Now the water so essential for the separation of diamonds from gangue is brought from the Vaal river, about 4½ miles away (also a place of alluvial diggings by a pipe line up to the farm. The diggers obtain the water at a price of 4d. per 60 gallons and they go very carefully about with it. Most of them separate diamonds from gravel only occasionally.

The digger is allowed to put a claim for 44 by 45 ft. down at any place of the farm given free for the digging. There is no surveying of the area and even the roads used can be suddenly obstructed by a claim. The claim is marked by a small sheet of metal 2 by 4 in. long on to which the name of the digger is written and this is fixed to a steel post which is pushed into the soil. For his claim the digger has to pay to De Beers, 5s. per month, and he can acquire up to three claims and can work for himself or with his family or employees, i.e. natives. He can use no equipment except shovel and pit axe or perhaps a lever crane, but no bulldozer or other kind of modern excavating machine. The diamonds which are found on these claims have at first to be certified by the claims inspector then they can be sold to free diamond buyers who come each Friday and occupy tiny huts provided by the company. From the proceeds of all the sales of diamonds, the company gets 10%. It is curious that a company so deeply interested in diamonds does not send any buyers to the farm and only quite occasionally diamonds found on the diggings are bought by De Beers.

The buyers appear to work for foreign firms and at the time of the present visit one of them was arrested, being accused of illicit diamond buying. The methods of excavation of diamonds are quite similar. Usually only 2.5 ft. of the rock is removed but occasionally gravel is found down to 15 ft. in the bedrock and diamond diggers follow down to this depth. Thinking they come into fissures or pot holes of old river beds, diamonds are suspected here. The method of separating is practically always the same primitive one. The sieving jigs called "Baby" separates the coarse material from the fine and the latter is immediately discarded. Then the material is fed into a rotary pan formerly driven by hand with cranks and now quite universally a small Diesel engine is used for rotating it. In this pan the heavier material goes through the centre and is discharged. The material is placed on a round sieve and shaken by hand, an operation usually performed by the digger himself. The last operation is emptying this sieve on a stand covered with sackcloth. With one movement the contents of the sieve are emptied and owing to the swinging movement the diamonds are kept in the centre.

A number of other diggers were visited, successful and unsuccessful ones. A retired government claim inspector had native diggers dig up to 15 ft. depth in small holes but was not successful. He asked for new claims in the recently opened annexe. The farm was recently favoured with quite phenomenal findings. One man found a 511 ct. stone for which he received £18,300. The life on the farm seems nothing less than comfortable. The diggers either live in tents, converted trucks, corrugated steel huts or caravans.

The diggers are very law-abiding To deal with diamonds or to possess polished diamonds one must be a South African licensed diamond dealer or cutter. One can see big brass plates of a prescribed size, about 4 in. high by 2 ft. long on all offices and undertakings connected with diamonds. Even the diamond research laboratories had asked one of their senior staff to become a licensed diamond cutter.

The life of the diamond diggers is very dull, only occasionally does it take a romantic and exciting aspect. There is no great hope in diamond digging. No new diggers are accepted and all those people who were digging in the mining districts of Berkley West, were diggers for a minimum period of 10 years or were already holding diggers certificates prior to the 1st April 1940. That means that no newcomers are accepted. All the diggers to whom I spoke were at least between 55 and 60 years of age. For this reason alone, the diamond digging may finish one day. Why did the De Beers open this farm for alluvial diggings about 2 years ago ? One reason is certainly a political one, i.e., they want to satisfy the demand of the diamond diggers. But might not the diamond diggers support another political party than De Beers ? The management realizes the bad conditions the diggers are living in. But the example shows they sometimes obtain up to £10,000 but still continue to live in a little tent. The field could be much better explored with modern equipment such as bulldozers, the use of which is not permitted to the diggers. But again the company would not dream of exploring the field in this way. Therefore, they must be in some way in favour of the digging and believe in romantic adventure as 80 years ago their forefathers did.

ASSOCIATION NOTICES

FORMATION OF BRANCHES

Midlands

A large number of Fellows and Members of the Association met at the Auctioneers' Institute, Birmingham, on 30th September, 1952, for the inauguration of the Midlands Branch of the Association. Mr. N. A. Harper, who had been invited by the Council to take the preliminary steps, welcomed members, particularly the President, Chairman and Secretary of the Association and Mr. O. Fahy, who qualified in the first examination which was held in 1913, and gave a brief outline of events that had led to the formation of the first Branch of the Association.

The President of the Association, Dr. G. F. Herbert Smith, in addressing the meeting, said that he regarded the occasion as an important event, and that he had good reason to believe that this feeling was shared by the Council of the Association. He gave details of the early work and struggles of the Association in the efforts made to stress the importance of gemmological study for the jewellery trade.

Mr. Trevor P. Solomon was elected Chairman of the Branch and Mr. J. Best, Honorary Secretary. As the result of a ballot the following were elected to serve on the organizing committee : Miss P. E. Cutts and Messrs. A. D. Conway, O. Fahy, N. A. Harper and D. N. King.

The new chairman was introduced by Mr. F. H. Knowles-Brown, Chairman of the Association and, in taking the Chair, Mr. Solomon said that it was gratifying that Birmingham had been chosen as the first centre for a Branch of the Association. They had heard that the original suggestion was for a Branch to be formed in Edinburgh, and it was gratifying that circumstances had enabled the Midland Branch to become number one branch. There was no doubt that the gemmologist was becoming more necessary nowadays, and could perform, many useful services. The new Branch was catering for the whole of the Midlands—it could be of considerable benefit to local members.

The Branch by-laws were notified and future meetings discussed. Dr. G. F. Herbert Smith and Mr. F. H. Knowles-Brown were thanked for their attendance and the help that they had given to the formation of the Branch.

West of Scotland

At a meeting in Glasgow on October 9, it was decided unanimously to form a branch of the Gemmological Association of Great Britain, to be known as the West of Scotland Branch.

Mr. S. D. Wood, who presided, said that it had been decided to form a local group and to endeavour to have it linked up in some way with the Gemmological Association. Since then he had been in touch with the Secretary of the

Gemmological Association, who had favoured the idea and had sent him a copy of the suggested rules for the working of such a branch. Membership would be open to subscribing Fellows, Associates, Probationary and Ordinary Members of the Association. If the branch wished representation on the Council of the Association, the procedure would be to nominate someone when vacancies occurred.

It was unanimously agreed to adopt the suggested rules and thereafter it was agreed, after a vote, that Mr. F. Bryan be chairman of the branch, with Mr. S. D. Wood as Hon. Secretary, and Messrs. J. D. S. Wade, J. Gillougley, E. W. McDonald, R. W. Dickson and Mrs. W. M. Revie (Ayr) as committee members. The annual general meeting would be in April. It was agreed to hold monthly meetings throughout the winter, one meeting to be held in conjunction with the newly-formed branch in Edinburgh.

Mr. Wood felt that if they were to stage an exhibition of gems in Glasgow in 1953, they would receive help from the parent body. A similar exhibition in Edinburgh had attracted over a thousand visitors. The more people they interested in gemmology the better. In addition, such an exhibition might be the means of bringing in more students to the gemmology classes held at Stow College.

East of Scotland

The East of Scotland Branch of the Association was formally constituted at the Heriot-Watt College, Edinburgh, on Wednesday, 22nd October, 1952. Mr. David L. Meek and Mr. D. J. Ewing were elected Chairman and Honorary Secretary respectively. Miss Thea McDonald and Messrs. Adam Forsyth, George Winnert, Robert Buckle and S. B. Dyce were elected to the committee. It is hoped that the Chairman of the Branch will be drawn from past Presidents of the Edinburgh and East of Scotland Association of Goldsmiths. The principal of the Heriot-Watt College has kindly given permission for major meetings of the Branch to be held at the College, and this will undoubtedly strengthen the link between the College and the jewellery trade in the East of Scotland area. During the first year of the Branch it is proposed not to hold more than four meetings. Although the third Branch to be formally constituted the idea of the formation of local gemmological groups or branches first came from Edinburgh.

It is proposed to hold joint meetings with the West of Scotland Branch from time to time.

Membership of branches is open to subscribing Fellows, Ordinary and Probationary Members in the district, and application to be included in the register of members should be made in the first instance to the Secretary of the Association at head office. No subscription is payable for branch membership.

COUNCIL MEETING

A meeting of the Council of the Association was held at 19/35 Gutter Lane, London, E.C.2, on Wednesday, 22nd October, 1952. Mr. F. H. Knowles-Brown presided.

The following were elected to membership :

FELLOWS

D.1951

Craik, Eric David, Edinburgh.

Tillander, Alexander Bertel, Stockholm.

D.1952

Allen, Herbert, Newbridge.

Boxall, William John, Edinburgh.

Cannon, John, Gerrards Cross.
Cuss, Francis Charles, London.
Davies, George Henry, Birmingham.
Davies, John William, Loughton.
Evans, Freda Margaret, London.
Flood, Frank, London.
Johnson, Douglas Robert, Toronto.
Jones, Albert Edward, London.
McRae, Arthur John, Glasgow.
Hval, Jens Olav, Oslo.
McKay, Jane, Glasgow.
Parsons, Charles Jay, El Cajon.
Paterson, William, Edinburgh.
Payne, Leslie, Bournemouth.
Pollington, Kenneth Ian, Welling.
Pye, David Trann, Methil.
Rice, Jean Mary, Birmingham.
Roos, Leo A., Lucerne.
Rudelsheim, Henri Salomon, Amsterdam.
Scott, Maxine O., San Diego.
Short, Elsie Andrina, Twickenham.
Smith, Jack Edwin, Reigate.
Spence, Christopher Roy, London.
Svensson, Kurt Wilhelm, Lidingö.
Velden, J. van der, Amsterdam.
Vos, Dirk, The Hague.
Whelan, Kenneth James, Hainault.

Ordinary

Henderson, Matthew M., Dundee.
Inches, Ian Hamilton, Edinburgh.
Mearns, Moureen Ann, Brisbane.
Robertson, George, Edinburgh.
Rouse, Aubrey William, Sydney.

Probationary

Ashley, Elsie, Newcastle.
Bache, Samuel, Old Hill.
Bender, Claus, Hamburg.
Clutterbuck, Marie Elizabeth, Birmingham.
Collyer, Rodney Frederick, Birmingham.
Forsey, John Norman, Sutton Coldfield.
Gance, Aryeh, London.
Kell, Ronald George, London.
Lipman, Maurice, Johannesburg.
Murray, Kenneth Granville, Sutton Coldfield.
Penfold, Victor Sydney, London.
Waites, Leslie Phillip, Birmingham.
Walsh, John Frederick, Birmingham.
Whitehead, Jack, Dudley.
Wilson, Malcolm Edward, Birmingham.
Woolley, Trevor William, Birmingham.

Fellows, 30. Ordinary, 5. Probationary, 16.

The style of the names of the newly formed Branches and financial arrangements were approved.

The Chairman congratulated the President on the appearance of the twelfth edition of his standard book "Gemstones" and the Vice-Chairman on his recently published "Physical Gemmology."

RAYNER PRIZES

As the special Rayner refractometer, which is intended to be a permanent prize in connexion with the award of the Tully medal, will not be ready for this year, Messrs. Rayner & Keeler have kindly placed a voucher worth £20 at the disposal of the 1952 recipient of the medal for the purpose of gem testing instruments. The same arrangement will apply this year, if the medal is awarded.

TALKS BY FELLOWS

Blythe, G.: "Gems." Women's Institute, Hullbridge, Essex, 20th October; St. Luke's Women's Fellowship, Southend, 21st October.

Solomon, S. T.: "Gemstones." Mary Tavy Women's Institute, 11th December.

Hamer, E. : "Gemstones." Preston Branch of the British Horological Institute, 12th November.

Penny, W. J. : "Jewellery." Chepstow Women's Institute, 21st October.

Webster, R. : "Gems and the Jeweller." Bristol and West of England Branch of the National Association of Goldsmiths, 13th November ; South Devon Branch of the National Association of Goldsmiths, 13th October.

Morgan, D. J. : "Precious Stones." Corby 25 Club, 22nd October.

Caudell, P. M. : "Gem Testing." London Area Association of Dispensing Opticians (Junior section), 6th October.

Leak, F : "Pearls." Young People's Fellowship, Tyndale Baptist Church, Clifton, 5th November. "Science of Jewellery." Toc H Women's Association, Winscombe, Som., 19th November.

Maton, E. W. : "Gemstones." Rotary Club of Bridgend, 1st December.

Parry, Mrs. G. : "Diamonds and other precious stones." S.W. and Monmouth Branch of the British Horological Institute, 18th November.

GEMMOLOGY IN LIVERPOOL

Classes in gemmology were commenced at the College of Art, Hope Street, Liverpool, in September last. Mr. Nigel Kennedy, F.G.A., is the instructor.

PRESENTATION OF AWARDS

Many members of the Gemmological Association came together again on October 20th for the reunion and the presentation of prizes gained in the earlier examinations. They met at the Goldsmiths' Hall and the President, Dr. G. F. Herbert Smith, thanked the Worshipful Company of Goldsmiths for their hospitality, and the encouragement they had always given the Association.

It was clear that Members could not always come to London for meetings, yet it was desirable if the Association was to flourish that those composing it should meet from time to time. He had been privileged to be at the new Midlands branch, centred at Birmingham. From what he had seen of the energy and zeal of the officers and members of that branch he was sure it would have a flourishing career. Since then two further branches had been formed, one in Edinburgh and one in Glasgow, covering the east and the west of Scotland. He looked forward to the time when the whole of Britain would be covered by branches of the Association.

The meeting represented the climax of the Association's academic year. Many of those who had sat for the examinations in June were there to receive tangible evidence of success. He understood that this year there had been a larger proportion of failures than usual. To those who had failed he said they should not be discouraged. There were two things to remember. One was that there was no royal road to learning. It meant study and unremitting toil to gain an adequate knowledge of a new subject. The other was that having had a first experience of an examination the entrant knew what was expected.

The Diploma commanded a very high prestige here and in all parts of the world. It commanded it entirely because its standard was adequate.

They were fortunate, continued the President, that they had Dr. W. Campbell Smith to present the Diplomas. He was in charge of the great national collection of minerals, rocks and meteorites at the British Museum (Natural History) that started as a private collection.

Dr. Campbell Smith then distributed the awards, congratulated those who had gained Diplomas and especially those who had gained them with distinction. He also congratulated the winner of the Rayner Prize in the Preliminary and Mr. Siedle of Ceylon who had won the Tully Medal, which thus went for the first time to an Asiatic country. It was fitting that this gemmological student should come from an island famous for its gems and whose ancient name was enshrined in the name of a new mineral sinhalite. He was pleased that a representative of the Singhalese Government here was able to be present to receive the award.

He recalled that in 1947 the Council of the Association had honoured him by electing him an honorary Fellow. But his connection with gemmology went back a lot farther. He had received his introduction to the subject when he first went to the Natural History Museum in 1910 from Dr. Herbert Smith. Those were the days when the pioneer work was starting and the study of gems was being made by several people here, one of the most active being Dr. Herbert Smith. One could not be in the Department of Mineralogy without being made aware of the great interest that was taken in the subject. Soon the proof sheets of Dr. Herbert Smith's book on gem stones began to come through. He had to read them and naturally went on to read the book.

He was glad to see that evening that Dr. Herbert Smith was on one side of him and Sir James Walton on the other. Dr. Herbert Smith was the direct successor of Sir Henry Miers, the first President of the Association, who had come to the Museum in 1882 just after it had moved from Bloomsbury to South Kensington. He lectured on the subject in 1895. The Natural History Museum had been fortunate in having in the last seventy years, four men who had taken a great interest in gemmology and they had acquired some notable stones through their activities. In the work that had been done they had always received valuable help from the Hatton Garden Laboratory. Accurate observation had led to the discovery of new minerals and such work might still be done by members of the Association. A new field was opening out in the fascinating study of inclusions in gem stones for which the tool was X-rays. Much remained to be discovered about gem stones and minerals and crystals.

Sir James Walton proposed a vote of thanks to Dr. Campbell Smith and said that gemmology had reached and passed an important milestone in that it was regarded as part of the great branch of the science of mineralogy.

More and more was being found out about gem stones and this knowledge was helping the trade. Some gem merchants might not make sufficient use of the scientific facts and aids that were available and jewellers could make use more in their display of the science of gems. It would have a great public appeal. The more one knew about the subject, the more interesting it became. And interest made for a happy and contented life.

WEST OF SCOTLAND BRANCH

The inaugural meeting of the West of Scotland Branch of the Gemmological Association was held in Glasgow at the Y.M.C.A. Club on the 24th November, 1952. Mr. Fred Bryan, F.G.A. presided.

Dr. G. F. Herbert Smith, President of the Association, who was the principal guest speaker, spoke of how he first became interested in the science of gemmology and recalled his experiences from then up to the present day. Other guest speakers were Dr. Helen Currie, of the Glasgow University Hunterian Museum and Dr. S. M. K. Henderson, Director of Museums, Glasgow Art Gallery and Museum. Dr. Currie explained the work of a Curator, with advice on methods of arranging and cataloguing a collection and Dr. Henderson discussed the work of the Art Galleries and the services rendered by his department to students and the public. He expressed his willingness to assist the Branch in connexion with a proposed gemmological exhibition to be held in 1953, probably in June.

Other guests of the Branch included Mr. D. Meek and Mr. D. Ewing, Chairman and Secretary respectively of the East of Scotland Branch of the Association, and Mr. W. Aitcheson, Vice-Chairmen of the Scottish Association of Jewellers. Mr. D. Ewing, speaking on behalf of the East of Scotland Branch, extended best wishes for the success of the Branch organizer in the West of Scotland and which had commenced its activities so successfully.

The next meeting of the Branch was convened for 4th December in order to consider proposals for the 1953 exhibition.

GLASGOW EXHIBITION

The West of Scotland Branch of the Association hopes to arrange a Gemmological Exhibition during June 1953 at the Glasgow Art Gallery & Museum. The convenor of the exhibition, Mr. S. D. Wood, 50 Talbot Drive, Glasgow, W.3, would be glad to hear from readers who would be prepared to loan interesting exhibits.

EARLY POLISHING OF DIAMONDS AND GEMSTONES

A paper " Early polishing of diamonds and gemstones " in particular in England, will be presented by P. Grodzinski to the Newcomen Society on February 11th, 1953. The lecture will take place in the Lecture Room of the Science Museum, South Kensington, London, S.W.7, at 5.30 p.m.