NOTES · AND · NEW TECHNIQUES

A REPORT ON THE NEW WATERMEYER SPLIT-FACET DIAMOND CUTS

By William C. Kerr

Basil Watermeyer has introduced a new technique in diamond cutting that virtually eliminates the "bow-tie" effect commonly seen in the standard oval, marquise, and pendeloque cuts. It has also been adapted to the Barion emerald cut to provide even greater fountaining of light. The author describes these cuts and his experience with them using cubic zirconia. He also discusses their applicability to colored stones.

In November 1981, Basil Watermeyer, of Johannesburg, South Africa, sent GIA a report on his latest work on diamond cuts, in which he described his efforts both to eliminate the "bow-tie" effect commonly seen in the oval and marquise cuts, and to improve brilliance and dispersion in these and other cuts. Using cubic zirconia, the optical properties of which make the material a very suitable diamond simulant, this cutter fashioned stones very similar to the drawings supplied by Mr. Watermeyer and subsequently published in the second edition of his book, *Diamond Cutting* (1982). The results showed that these new cuts come closer than any of their predecessors to attaining the goals stated above.

The cuts described in Mr. Watermeyer's report were obtained using his new "split-facet" technique. On the oval and marquise cuts, the usual large center facet has been split into, or replaced by, two facets, so the pattern has a 10-fold symmetry rather than the usual eight-fold symmetry. On the pendeloque, extra facets have been added near the point. Mr. Watermeyer has also modified the longer versions of the Barion emerald cut, with the split-facet technique applied to the pavilion of the stone.

Because the drawings provided contained no specific elevation angles and rotational placements to suit the crown and pavilion views given, the author determined the missing data on the basis of his own experience. The changes in design represented by Mr. Watermeyer's cuts, though dramatic in what they accomplish, are not so foreign from standard patterns that an experienced cutter cannot determine the additional details and reproduce them adequately.

Perhaps it should be pointed out that any cut used for diamond can be adapted to other gemstone materials with different optical properties simply by choosing a set of angles that makes the best use of the optical properties of that material. Consequently, these new cuts should be applicable to, and equally successful in, most colored gemstones even though their optical properties are lower than those of diamond.

The purposes of this article are: (1) to briefly discuss the "bow-tie" effect and suggest changes a gem cutter can make to minimize this undesir-

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able condition, (2) to present drawings of Mr. Watermeyer's cuts and explain how they differ from the usual standard cuts, and (3) to show photos of stones (cubic zirconia) fashioned from Mr. Watermeyer's drawings for the reader's evaluation.

THE "BOW-TIE" EFFECT

The eye perceives the "bow-tie" in an oval or marquise cut (diamond or colored stone) as a reflection of light in the midsection of the stone that differs greatly from smaller reflections seen toward the ends of the stone. Whenever the length of a stone is appreciably greater than its width, this unequal internal distribution of light occurs. The gem cutter's task is to find a pattern of facets to fit the shape or outline of the stone and to create a pattern of reflections that is uniform throughout. Brilliance must have the same intensity level, and the size of the reflections should blend smoothly with the shape of the stone.

An infinite number of light rays fall on the crown of a faceted stone, from as many directions, at any given time. To most of us it is a matter of conjecture as to what percentage of these rays are taken into the stone, distributed well, and then returned to the eye of the observer. "Clocking" the crown facets, and more particularly those on the pavilion *parallel to the long direction* of a faceted stone, creates a problem. The word *clocking* refers to the rotational placement of the facets about a circle, or as the clock hands move around the dial. Light rays entering are bounced back and forth across this narrow dimension. They either return through the midsection of the crown or leak through the same area of the pavilion. When these center facets are larger (and they invariably are) than those toward the ends, the oh-so-ubiquitous "bow-tie" confronts the observer.

To correct or diminish the "bow-tie" effect, suppose the cutter avoids any parallelism of facets near the stone's midsection and clocks the facets in a more gradual curving pattern in the center part of the stone. The standard marquise cut usually has wide center facets of much greater surface area than those closer to the ends. By replacing the two wide center facets, which are directly opposite each other, with perhaps eight or more "fanned out" facets near the middle of the stone, we find that the light is now better distributed and directed toward the ends rather than concentrated or trapped near the center. This approach produces a more attractive stone without the problems inherent in the more standard patterns. The Watermeyer cuts successfully follow these principles to both diminish the "bow-tie" effect and increase the brilliance of the stone.

THE SPLIT-FACET OVAL CUT

In discussing the "bow-tie" effect common to the standard oval-cut stone, Mr. Watermeyer has stated (personal communication, 1982) that elimination of the "bow-tie" was actually achieved about 30 years ago, but that diamond cutters persisted in leaving broad "base" curve facets that again introduced it.

Mr. Watermeyer's drawings of his split-facet oval are reproduced in figure 1. In these drawings, no main bezel facets (only two star facets) parallel the long axis of the oval. Thus, no trapped side-to-side reflections occur. The split-facet oval has 10 main bezel facets, whereas the standard oval cut has eight. The pavilion view shows eight main facets clocked to align with eight main facets on the crown, but the usual two pavilion end main facets have been replaced with two sets of four girdle-like facets. The side or profile view, in

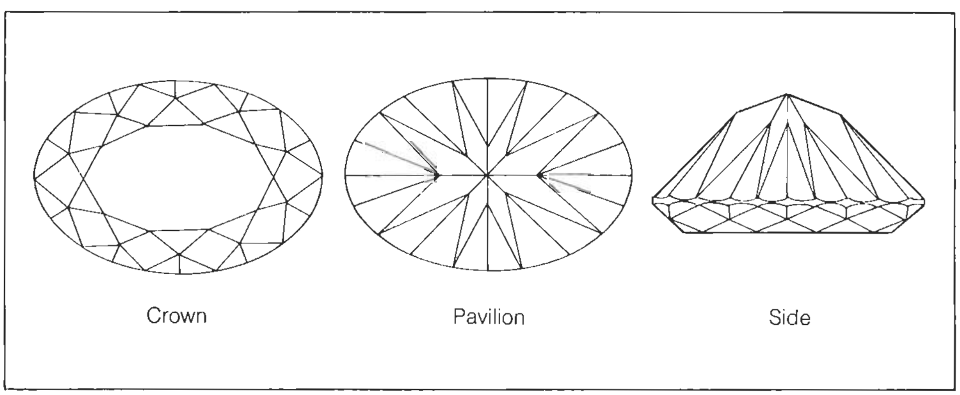


Figure 1. The Watermeyer split-facet oval cut (total number of facets = 70, including culet). Drawings ©1981 by Basil Watermeyer.

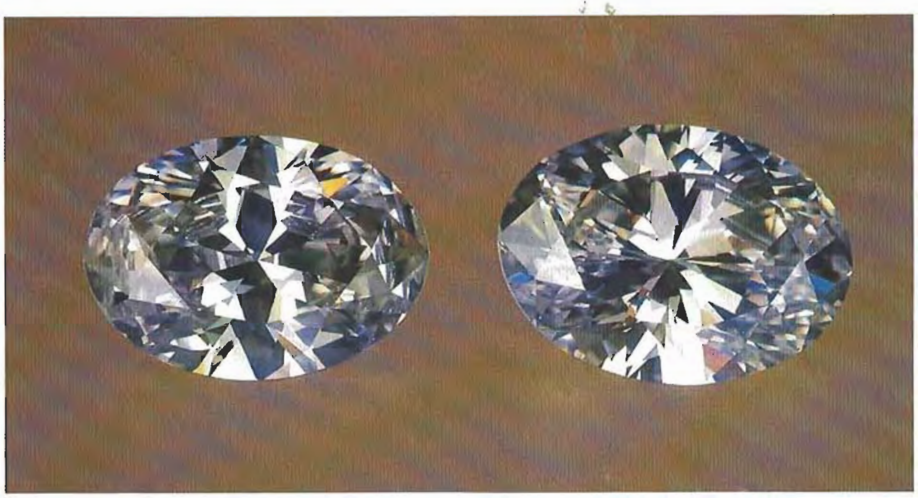


Figure 2. Left = standard oval cut in cubic zirconia, 10.44 ct (note the "bow-tie" effect); right = Watermeyer split-facet oval cut in cubic zirconia, 11.34 ct. Photo by Tino Hammid.

addition to picturing how the pavilion aligns with the crown, shows that the six center girdle facets do not reach the actual culet ridge on the split-facet oval as they do on the standard oval. Last, four of the eight pavilion main facets are larger than the others.

Figure 2 shows cubic zirconia fashioned in the standard oval cut (left) and in the Watermeyer split-facet oval cut (right). The "bow-tie" effect so apparent in the first stone is virtually absent in the second. It should be noted that a longer oval is much less efficient in using the light that falls on it than one that more nearly approaches the round brilliant shape. The Watermeyer oval cut is particularly effective with the more difficult elongated stones.

THE SPLIT-FACET MARQUISE CUT

The marquise cut is essentially an oval shape with pointed ends. The cutter knows that irregular shapes with sharp corners usually turn out to be less efficient, and more light is lost than in those patterns that have more symmetry. Two views by Mr. Watermeyer of the split-facet marquise cut appear in figure 3. The crown view again shows a 10 main or bezel facet pattern with no parallelism of facets except for the two center stars. Pavilion facets match (align with) crown facets except at the ends. Notice that the pavilion main facets near the center of the cut are smaller

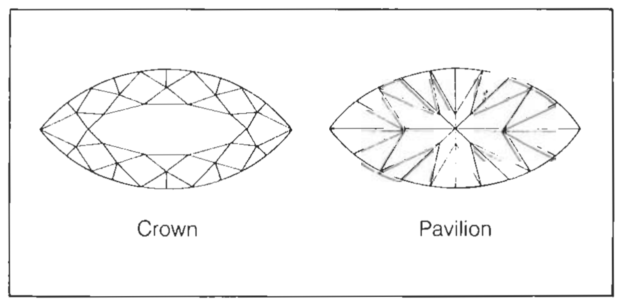


Figure 3. The Watermeyer split-facet marquise cut (total number of facets = 70 including culet). Drawings ©1981 by Basil Watermeyer.

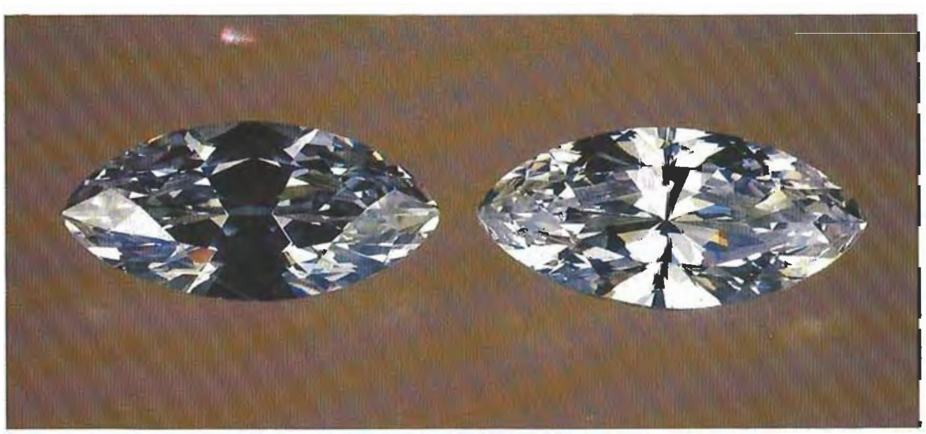
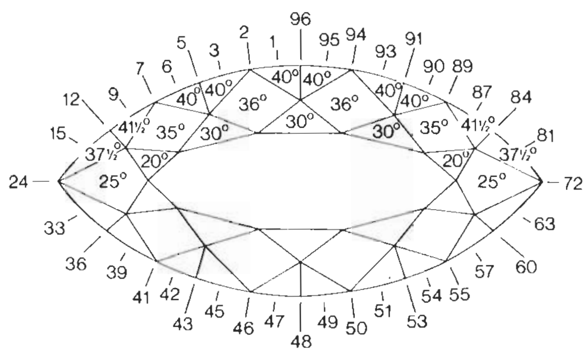


Figure 4. Left = standard marquise cut in cubic zirconia, 7.51 ct; right = Watermeyer split-facet marquise cut in cubic zirconia, 7.74 ct. Photo by Tino Hammid.

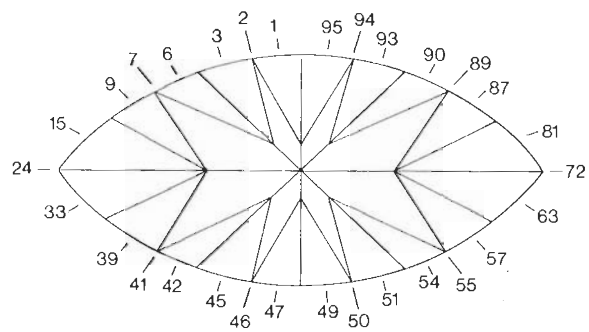


THE SPLIT-FACET MARQUISE—96 INDEX
(Ratio length to width, 2.1:1)

Crown

1. Cut 4 facets at 36° elevation index 2, 94, 46, and 50.
2. Cut 4 facets at 35° index 7, 89, 41, and 55.
3. Cut 2 ends at 25° index 24 and 72.
4. Cut 6 stars at 30° index 96, 48, 5, 91, 43, and 53.
5. Cut 4 stars at 20° index 12, 84, 36, and 60.
6. Cut 20 crown girdle facets as index locations indicate on drawing. (Elevation angles may vary from those shown.)

Polishing order: from table toward girdle.



Pavilion

1. Cut 4 facets at elevation angle of 41° at middle of pavilion index 2, 94, 46, and 50.
2. Cut 4 facets at 39½° elevation index 7, 89, 41, and 55.
3. Cut 4 facets at 36½° index 9, 87, 39, and 57.
4. Cut 4 facets at 31° index 15, 81, 33, and 63.
5. Cut 4 girdle facets at approximately 42° index 1, 95, 47, and 49.
6. Cut 4 girdle facets at approximately 41° index 3, 93, 45, and 51.
7. Cut 4 girdle facets at 39° elevation index at 6, 90, 42, and 54.

Polishing order: from culet toward girdle.
(Polish girdle on wood lap)

Figure 5. Planned program for cutting cubic zirconia to the Watermeyer split-facet marquise design.

in area than those farther out. This results in better distribution of light and in greater uniformity in the size of the pavilion reflections. The photograph in figure 4 shows the far superior split-facet marquise cut on the right. Again, the "bow-tie" effect is easily seen in the standard marquise on the left.

Figure 5 presents a working drawing for cutting the Watermeyer split-facet marquise with a 96-index gear wheel on a modern faceting machine. Angles of elevation are marked on the appropriate facets, and "clocking" index numbers indicate the relative rotational placement of the facets. This illustration represents this cutter's interpretation of the drawings reproduced in figure 3. It was developed while actually cutting the Watermeyer marquise shown in figure 4. The angles given are for cubic zirconia. This cutter sees no reason why Watermeyer's split-facet technique cannot be used on many of the colored stones by changing the angles for the crown and pavilion facets to suit the lower refractive indexes of such stones.

THE SPLIT-FACET PENDELOQUE (PEAR) CUT

Figure 6 details the 10 main (bezel) facet design of Mr. Watermeyer's split-facet pendeloque. As most cutters are aware, the standard pear or pendeloque usually has an eight-fold symmetry. One familiar with these shapes will note two extra main facets near the sharp point on the Watermeyer cut. Like the marquise, the pendeloque presents the cutter with a great challenge: to maintain uniform brilliance throughout the stone. Basil Watermeyer's design for this shape fully

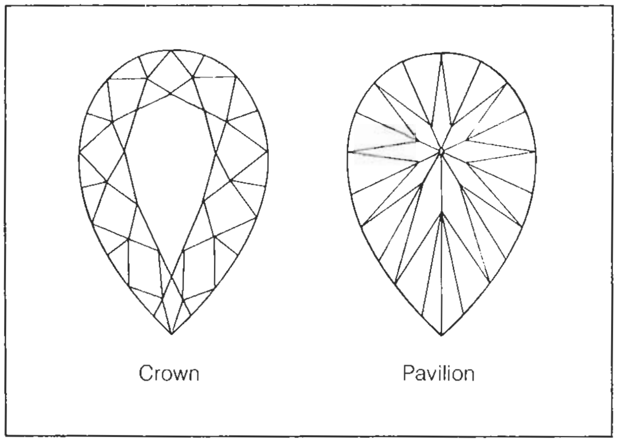


Figure 6. The Watermeyer split-facet pendeloque cut. The same techniques used on the marquise can be adapted to the pendeloque. The increased scintillation is most apparent in long shapes. (Total number of facets = 71,* including culet.) Drawings ©1981 by Basil Watermeyer.

Figure 7. The Watermeyer split-facet pendeloque cut in cubic zirconia, 10.85 ct. Photo by Tino Hammid.

meets this challenge. Note from the drawing of the crown in figure 6 that the main facet on the point is very small and there is no pavilion facet directly opposite it. Mr. Watermeyer's pendeloque pattern cut in cubic zirconia is shown in figure 7.

THE SPLIT-FACET TECHNIQUE APPLIED TO THE BARION EMERALD CUT

The Barion emerald cut, also developed by Mr. Watermeyer, has straight sides with the pavilion break facet (the one nearest the girdle) called the "half-moon." The triangular, or "round brilliant"-like, facets extending to the culet meet this pavilion break facet near the girdle, thus maintaining the straight-line shape. All versions of the Barion emerald cut have a three-step crown combined with this unique pattern of triangular facets on the pavilion. Mr. Watermeyer has applied the split-facet technique to the pavilion of the medium-length emerald shape as shown in figure 8. Only two extra facets are added. On the long emerald shape, point corner halves of the standard cut are inserted to maintain a symmetrically balanced faceting sequence. For the extra-long shape, a second wing is introduced to maintain a continuous flow of scintillation as well as a balanced faceting sequence.

The extreme closeness (with regard to rotational placement) of facets to adjacent facets on the pavilion, plus the fractional elevation angle changes from the center of the stone toward the ends, of these same facets, are responsible for the

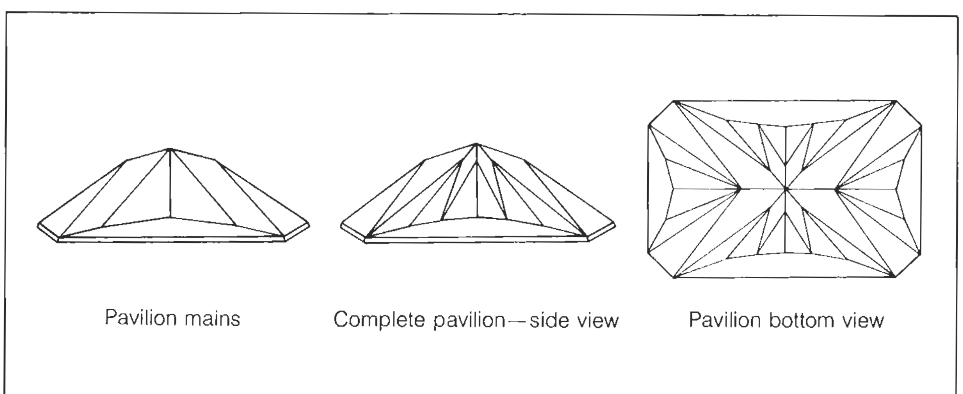


Figure 8. The Barion emerald cut (here, for a medium-length stone), with the split-facet technique applied. The proportions recommended by Mr. Watermeyer for a medium-length stone are length/width = 18%/60%. Crown (not shown) is a standard 3-step pattern common to all emerald cuts. Drawings ©1981 by Basil Watermeyer.

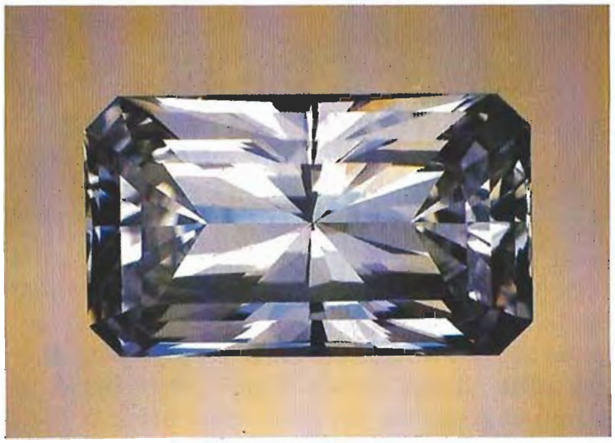


Figure 9. Barion emerald cut in cubic zirconia, 18.79 ct. Photo by Tino Hammid.

lively "fountaining" of light that Mr. Watermeyer has achieved (figure 9). To the experienced cutter, this statement concerning the pavilion facets is a revelation of some magnitude regarding faceting techniques. The gem enthusiast who is not a cutter should have little difficulty recognizing the superior "life" this stone displays. It should be noted, though, that because the facets are so close to one another both in elevation and in clocking, the pavilion of the Barion emerald is very difficult to cut.

CONCLUSION

Mr. Watermeyer's new split-facet technique represents an important breakthrough not only in diamond cutting but also in the cutting of the so-called colored stones. Harder stones (8 and above on the Mohs scale) such as corundum, spinel, topaz, and even beryl should easily adapt to these designs. Harder polishing laps, such as the ceramic lap, used in conjunction with one-quarter micron diamond abrasives, should produce exceptionally beautiful colored stones in these fascinating new designs.

REFERENCE

Watermeyer B. (1982) *Diamond Cutting*, 2nd ed. Centaur Publishers, Johannesburg, South Africa.