# A HISTORY OF GEM BEADMAKING IN IDAR-OBERSTEIN

**Si Frazier, Ann Frazier, and Glenn Lehrer**

*Located at the southwestern edge of Germany, Idar-Oberstein is the historic stone-cutting center of Europe. The origins of the industry go back at least 500 years. The industry was originally based on local deposits of agate, jasper, rock crystal, and amethyst but beginning in the 19th century, all kinds of rough gemstones began to be imported from around the world. The industry grew very rapidly from the middle of the 19th century. A great deal of this success was based on the manufacture of agate beads ("African money") for export to Africa and the Middle East. This article not only discusses the history of the industry, but also provides in-depth information concerning the techniques and tools used in beadmaking and drilling.*

## INTRODUCTION

Idar-Oberstein is a small town of roughly 50,000 inhabitants in a narrow, picturesque valley in the Hunsrück Mountains on the very western edge of Germany. It is located in the state of Rheineland-Pfalz, about 110 km southwest of Frankfurt am Main.

Idar and Oberstein were originally two separate towns, each conducting its own unique business in the gem and jewelry industries. Idar was the gem cutting center and Oberstein was known for its jewelry manufacturing. Oberstein has long been only one of many jewelry-manufacturing centers in Europe, but Idar has had few rivals in the gem-cutting field. In 1933, Hitler consolidated the two towns into one. The gem-cutting region of Idar-Oberstein is now made up of the city itself and many small hamlets that dot the surrounding hills.

Idar-Oberstein is widely recognized within the gemstone industry as the most significant European cutting center for gemstones other than diamonds. Records show that gem cutting in the general region dates back to the 14th century (Wild 1998). In fact, the city officially celebrated the 500th year of the gemstone industry in Idar-Oberstein in 1997. Its history is almost certainly older than that, but there is a paucity of records due to the extensive destruction that took place in the region during various wars and upheavals. Destruction of property and lives was especially severe during the 30 Years War (1618-1648) when the population of the area was reduced to one-third of the pre-war figure.

The depopulation was so severe that the local dukes imported colonists from Switzerland and other places. The nearly 100 years between the beginning of the 30 Years War and the end of the War of the Spanish Succession (1714) saw a seemingly endless series of wars affecting the general area of Idar-Oberstein (Brandt 1980:36-40). As various armies went to and fro through the region, what they could not steal and haul away, they usually burned. The reason for the wholesale burning of villages was because the peasants and townspeople usually kept what money they had in the form of silver and gold coins which they often hid in the walls of their houses. When a house burned, these caches of coins would melt and the metal could often be recovered from the ashes (Dieter Jerusalem 1996:pers. comm.). It really did not matter if an army coming through the region was friend or foe, the results were the same. The armies of that time basically lived off the land and one of the major rewards of being a soldier was the ability to participate in plunder.

One of the many unfortunate consequences of these terrible wars affects us to this day. Records of all types also fell victim to the ravages of war. This makes the historian's job very difficult, and for our proposes here, presents a difficulty in trying to trace the exact history of the gem industry in Idar-Oberstein.

Virtually unknown to Americans outside the gem business, this region has been one of the major

***BEADS*** 10-11:35-47 (1998-1999)

**Figure 1.** A typical old agate-cutting mill. The large multi-paned windows were a typical part of the highly specialized architecture. Then as now, the agate cutters needed adequate light. Note the spare sandstone cutting wheels leaning against the building (all photos courtesy of Dieter Jerusalem).

gemstone processors and trading centers of the world. Until quite recently, Idar-Oberstein was the colored-gemstone cutting capital of the modern world. However, during the 1970s and 1980s, its dominance slipped as competition from countries with lower labor costs increased. These include Thailand, Brazil, Formosa, Hong Kong, Korea, India, Sri Lanka (Ceylon), and, even more recently, mainland China.

It is easy to understand why Idar-Oberstein has remained so obscure for centuries. Gems have always been traded in secrecy and their sources were often obfuscated in order for people in the trade to protect their interests. The techniques of gem cutting have also been closely guarded, being passed on from father to son, master to apprentice, or have been kept so secret that they went with the gem cutter to his grave.

## CUTTING MILLS

For centuries, the *Edelsteinstadt* ("gemstone city," a term frequently used by local boosters and politicians) has been characterized by the unique agate-cutting mills that thickly lined the small stream (*der Idarbach*) that flows through Idar. They were rather crudely built, half-timbered (*Fachwerk*) buildings with slate roofs and large multi-paned windows (Fig. 1). These provided light for the cutters who were grinding gemstones inside on huge sandstone wheels powered by a large water wheel on one side of the building. The earliest mill for which there is documentary evidence is the now-vanished *Schultheise-Schleife* (literally "the mayor's cutting mill") which dates back to 1531 (Herbst 1978:14). The record notes the selling of rights to one-third of a grinding wheel to Wirich Poller who apparently was the illegitimate son of the local duke. It was common practice for individuals to own the rights to use one half or even smaller fractions of one of the huge wheels. Herbst (1978:14) believes that the transaction in 1531 indicates that the earliest mills must have been erected at least as early as the first two decades of the 16th century.

The oldest cutting mill to have survived into modern times is the *Au-Schleife* which was built in 1603, in what is now downtown Oberstein. It had to be torn down in 1985, to make way for an on-ramp for the

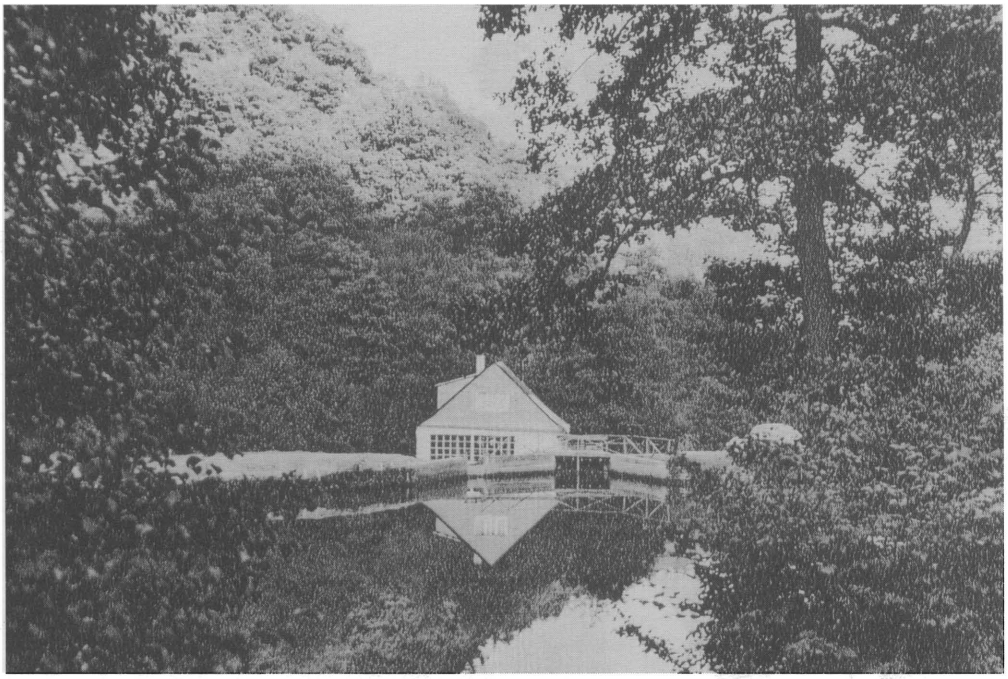

**Figure 2.** This is the only cutting mill still in operation in the Idar valley. After falling into disrepair, it was purchased by the city of Idar-Oberstein in 1953, renovated, and put into working condition by a group of public-spirited citizens. Today it sits in a lovely small park and is operated as a tourist attraction to show visitors how agate was cut in times gone by. It is now known as the *Weiher-Schleife*. It was originally built as the *Kallweisweiher-Schleife* in 1754.

new freeway that was built to bypass the medieval heart of the city. This caused a great outcry and the building was dismantled with care with the intention of reassembling it a short distance away in a small history park. So far this has not come to pass.

Most of the mills were abandoned and fell into disrepair during the 1930s. Although the gem-cutting industry expanded during the first part of the 20th century, especially in the 1920s, electricity had made water power obsolete. Some mills were converted to dwellings or other purposes, but most just disappeared. One remains as a tourist attraction on the northern edge of Idar (Fig. 2).

During a visit to Idar-Oberstein in 1774, Cosimo Alessandro Collini, a Florentine polymath who was a former secretary to Voltaire and the director of the Cabinet of Natural History in Mannheim, found 26 agate-cutting mills employing 130 persons in operation on the Idarbach (Collini 1776:231). What he encountered was a nearly unique and very-well developed and sophisticated quartz-gem cutting industry in full bloom. Although Collini does not say as much, it is doubtful that there was a more sophisticated and technologically advanced gem-cutting industry elsewhere in the world. Collini, who was quite knowledgeable about gems and minerals, described exactly how gem cutting was carried out in the mills and published a widely reproduced, detailed drawing of the interior of a typical one (Fig. 3).

A smaller but similar industry had developed in the vicinity of Freiburg im Breisgau in the upper part of the Rhinegraben, probably even earlier than the one along the Idarbach, but it never grew anywhere near as large or as important as the one in Idar. The cutting technology at both locations consisted of a technically sophisticated water-wheel driven combination of gears, belts, and shafts that turned sandstone wheels for grinding and wooden cylinders for polishing.

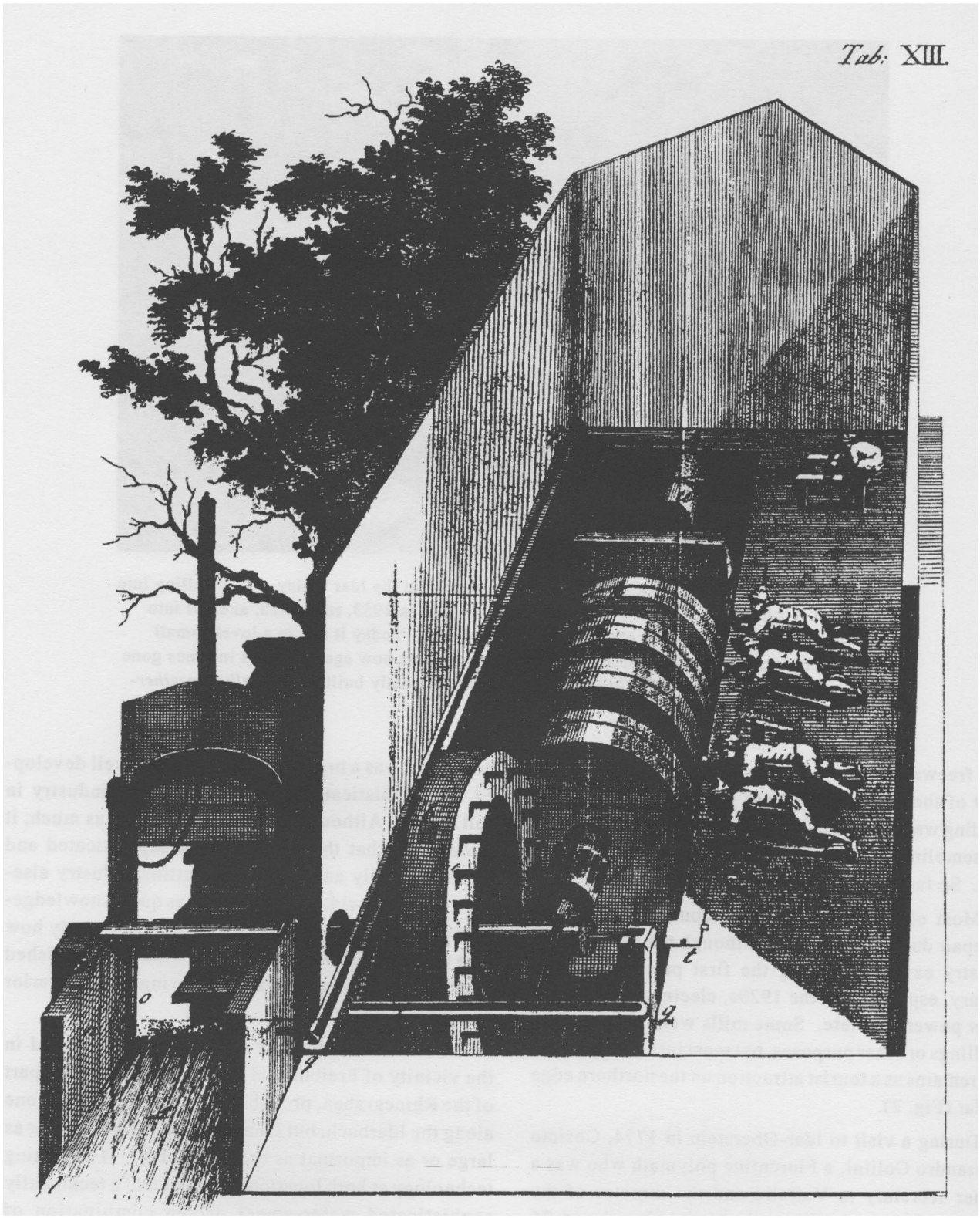


**Figure 3.** The interior of an Idar agate-cutting mill as sketched by C.A. Collini (1776:Pl. XIII).

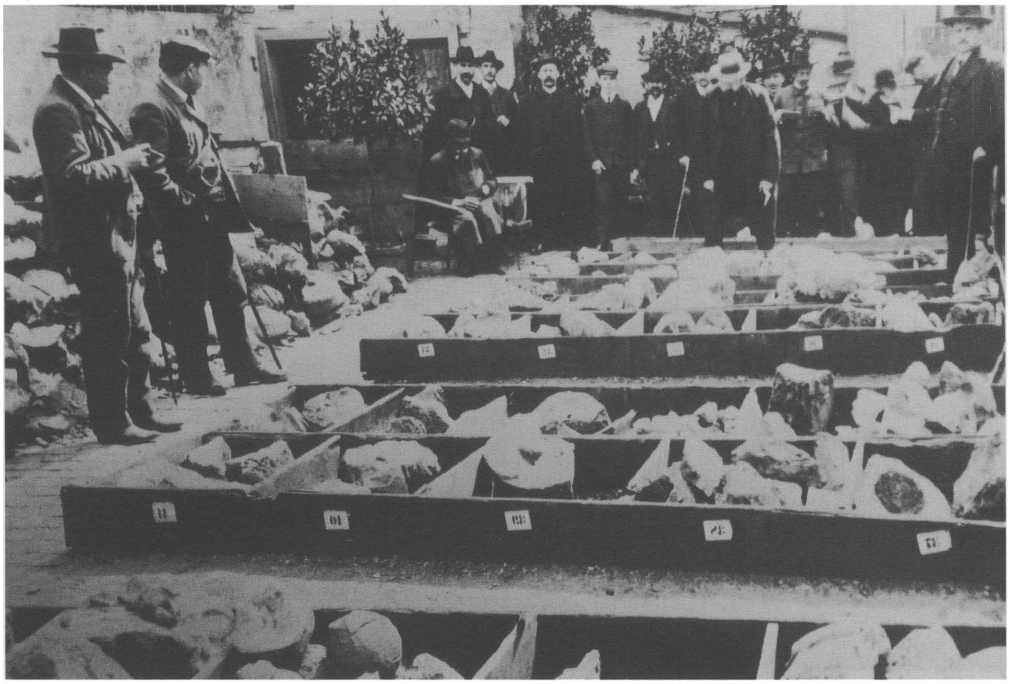

**Figure 4.** An agate auction in Idar. This was the way most Brazilian agate was sold there until quite recently. The large nodules were of gray agate suitable for staining. Small chips were knocked off well beforehand and subjected to the ordinary staining process, usually using red, green, and blue dyes. In this way the cutter bidding on a particular lot would know how suitable the agate was for his purposes.

## SOURCES OF CUTTING MATERIAL

As far as we know, at the time of Collini's visit, the Idar industry worked exclusively on local agates, jaspers, and, perhaps to a minor degree, on crystalline quartz from the surroundings hills and from similar gem occurrences a short distance to the west of Idar- Oberstein. By the turn of the century, there were limited imports of gem materials, such as carnelian, from India. In the 1820s, German emigrants from the Idar-Oberstein region to southern Brazil discovered unbelievably rich deposits of agate in the state of Rio Grande do Sul, and the first shipment was made to Idar in 1834 (Wild 1963:223). The art of staining agate developed between 1813 and about 1860, by which time a whole spectrum of colors had been developed. It was found that certain types of Brazilian agate were eminently suited for staining (Fig. 4). The agate could be turned red, white, blue, green, black, or yellow using inorganic chemicals, colors which would not fade in the harsh sunlight of Africa or the Middle East. The recipes were regarded as highly important trade secrets. Indeed, to this day, there are certain staining processes about which their practitioners refuse to divulge any details.

The Idar stone-cutting industry bloomed and expanded, reaching a maximum of 56 mills on the Idarbach in the mid-1860s. This averaged one every 165 meters, making it the most intensively used stream in Germany (Herbst 1978:28).

The water-powered mills enabled gems and beads to be cut at minimum cost as long as it was not a drought year. This, coupled with the abundant supplies of Brazilian agate (Fig. 5), enabled Idar to supplant the Cambay region of India as a supplier of agate beads to Africa and the Middle East (Frazier and Frazier 1993, 1994).

It should now be evident that the historical roots of the Idar gem industry do go back very far indeed, but the further back one goes the more difficult it becomes to trace those roots with any degree of certainty. A great deal that has been written about the history of the industry in the German literature has been pure speculation and wishful thinking disguised as fact. Unfortunately, what little has been written in English

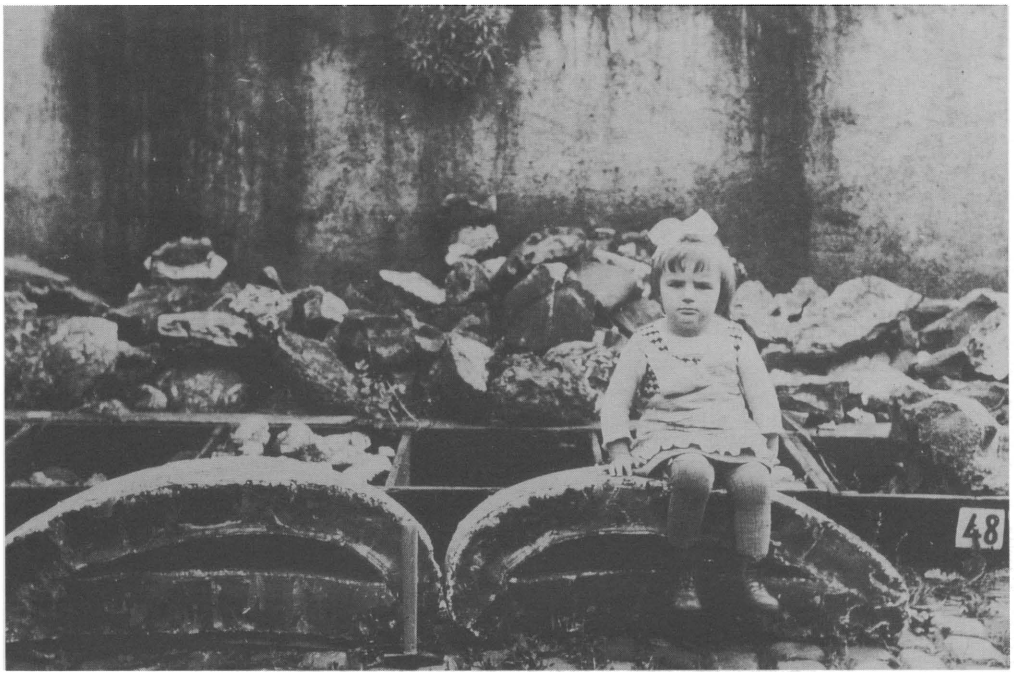


**Figure 5.** The agate nodules imported from Brazil were enormous by European standards and, indeed, have seldom been exceeded in size any place in the world. A massive geode that has been split in half occupies the foreground.

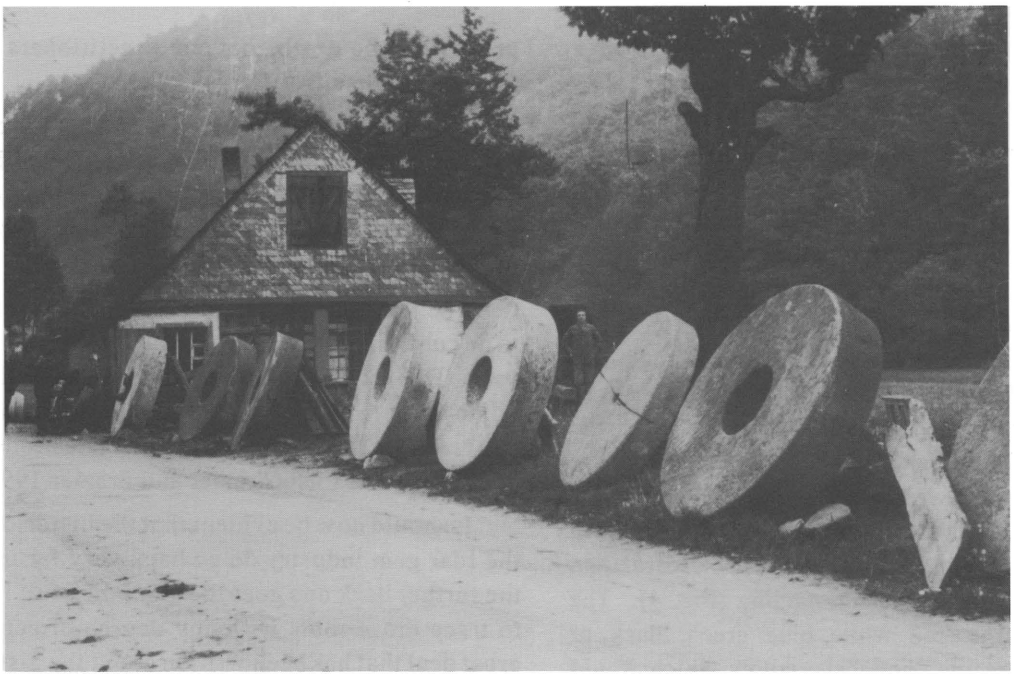

**Figure 6.** A selection of sandstone wheels for sale around 1900. That these wheels have not been used is evidenced by the lack of grooves in the working face of each wheel.

on the subject has been, almost without exception, based on questionable German sources, naively translated, and published, more often than not, without proper attribution. We have tried to avoid these sources and all those cited herein are believed by us to be careful and objective scholarly works.

## THE VERY EARLY HISTORY OF IDAR

The history of Idar dates back to Roman times, and ruins still stand in Oberstein which are nearly a thousand years old. Records reveal that an agate-cutters guild existed in the 15th century in the Saarland which lies a short distance to the west of Idar-Oberstein (Wild 1991:41). Many of the people of Idar would like to believe that gem cutting in the region dates back to the Roman period. While there is no substantial evidence for this, certain facts can lead one to theorize about the Romans and their possible involvement with gemstones in the region.

An old Roman settlement called Hidera was located above the valley where Idar now stands. It was here that an engraved cameo was found 6.7 m below ground level in a sewer excavation. Experts on Roman gem engraving at the University of Bonn have concluded that it is unquestionably of Roman style (Prof. Dr. Hermann Bank 1994:pers. comm.). It is still unknown, however, if it is of local manufacture.

Another interesting fact is that an old Roman road ran very close to the Steinkaulenberg, a hill above Idar where an important agate mine operated for many years (Frazier and Frazier 1988:23 ff.). The road ran from the city of Trier to Frankfurt. In its day, Trier was the Roman capital north of the Alps and, next to Rome, the second most important city in the Roman Empire. However, whether or not the Romans mined agate in the region is still awaiting scientific verification. So, although many Germans would like to trace their local gem industry back to Roman times, there is currently only enough evidence to say that it is an intriguing possibility.

Existing documentary evidence establishes the presence of an important gem-cutting industry in Idar-Oberstein by 1500 (Bank 1997:131). For the next three centuries, the industry grew slowly but steadily. Its success was based on three factors. First, there were substantial agate and jasper deposits in and near Idar-Oberstein. Contrary to nearly all English-language articles and most German-language reports, these deposits were never exhausted, but merely made uneconomical by the importation of large quantities of inexpensive and abundant Brazilian agate around the middle of the last century (Bank 1984:37). The agate was transported as ballast on sailing ships so the transportation costs were low. Today, the visitor can easily confirm this by visiting the Steinkaulenberg. This old agate mine has been carefully cleaned up and made accessible to the public. Agate nodules, masses of jasper, and large geodes lined with amethyst or smoky quartz crystals encountered during the renovation were left in place in the gallery walls and spectacularly lit to show them off. The result is the nearest thing to the gem mine in Snow White and the Seven Dwarfs that one can possibly visit without Walt Disney's help.

The second factor in Idar-Oberstein's early and continuing success as a gem-cutting center was the presence just to the south of Idar of a type of sandstone that, when fashioned into wheels, was perfect for working quartz-family gems. It was nearly pure quartz sandstone (quartz arenite) with quartz grains of an ideal size and roughness. The degree of compaction and the small amount of clay binder made it too soft for milling flour or sharpening swords, but perfect for lapidary work. To this day, many Idar cutters believe that the local sandstone wheels produce better results on large crystalline quartz objects than any modern formulations of silicon carbide or diamond. Others disagree, of course. The stone for the wheels was quarried near Landstuhl in the Pfalz region. It occurs in a geological formation known as the Rotliegend, a sandstone deposited during the lower Permian period.

The sandstone wheels (Fig. 6) measured up to 2 m in diameter and up to 50 cm in width, and weighed up to about 3,000 kg. Each was wide enough so that two cutters could work on one wheel (Fig. 7). These large wheels were set with a shaft in bearings for turning. Each wheel was driven by elaborate gears, turning at a specific speed, that are all connected to a single bearing shaft on the water wheel. Several large and many small grinding and polishing wheels were also run by means of belts powered by the shaft of the waterwheel.

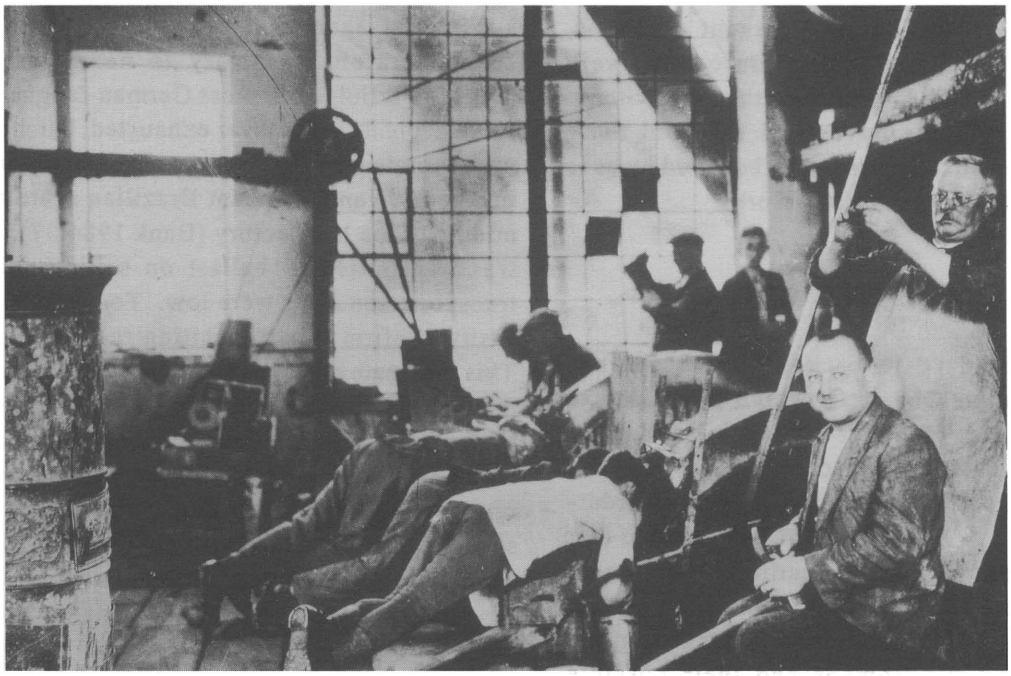

**Figure 7.** The interior of an agate-cutting mill. The sandstone wheel in the foreground is being shared by two men. The man in the lower right, possibly the owner, is trimming rough gem material to size and shape using a small hammer and a steel rail. This was much cheaper and faster than sawing.

**Figure 8.** Polishing gems on a beechwood cylinder. Part of the elaborate gear-and-belt system which transferred power from the water wheel to the equipment is visible in the background.

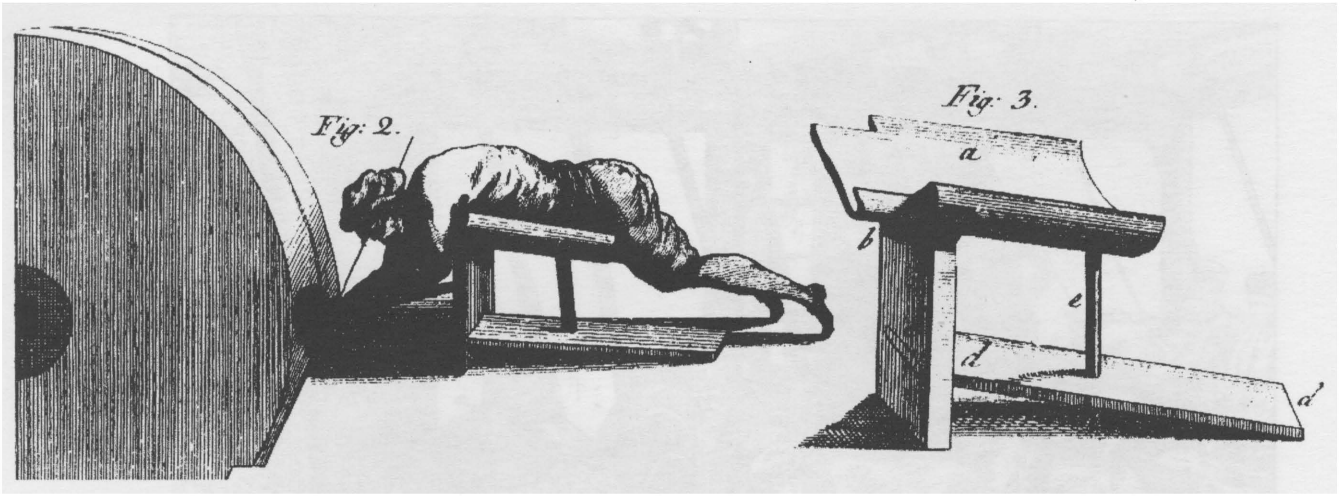


**Figure 9.** The cutter at work, with a detailed view of the special stool he uses (Collini 1776:Pl. XIV, Figs. 2-3).

The third factor in Idar-Oberstein's success was the negligible cost of the water power. Once the mill was built, the wheels ran at minimal cost.

## MAKING BEADS IN IDAR-OBERSTEIN

### Bead Cutting

The hand cutting of fine beads as performed today in Idar-Oberstein is very similar to how it was done in centuries past. It is an accepted fact in Idar that if one wants a very fine bead made, then it should be done by the traditional hand methods on a sandstone wheel and not by a bead machine, which has become the common commercial practice.

Since sandstone is relatively soft, the face of the wheels could be carved with various negative shapes. For shaping a bead or sphere, the cutter used a wheel which had a semicircular groove cut into it. He held a cupped wooden implement whose end duplicated the shape of the groove in the wheel. The roughly shaped bead rotated between the wheel and the stick, and all the projections were quickly ground off. The huge inertia of the massive wheels was an important factor in the success of this method. A round agate bead could be formed with great speed and accuracy using this technology as the laws of physics dictate that a bead will become a perfect sphere when turned in this manner. Oval beads were made in the same way by using a wheel with a broad shallow groove, and even bicones were efficiently produced by this method. If the bead was to be faceted, this was done on the flat part of the wheel, the cutter holding the bead in his hand to form each facet. Because of the nature of the sandstone, beads of agate, jasper, and crystalline quartz came off the wheel with a dull surface that is actually a very good pre-polish. The beads were given their final polish on beechwood cylinders (Fig. 8) using diatomaceous earth from the Schwarzwald (Black Forest) to the south in Baden (Dieter Jerusalem 1993:pers. comm.). The process is amazingly fast when utilized by an experienced cutter, and a good cutter could turn out many, many dozen beads in an hour with great proficiency. Unfortunately, it is a skill that is dying out.

The manner in which the agate cutter worked was unique. He would lie on a wooden bench that had been hollowed out to fit the contours of his chest (Fig. 9). He would then push his feet against a wooden rail nailed to the floor behind him in order to bring his full weight against the wheel (Fig. 10). The power driving the wheel lasted only as long as there was water in the storage pond or water-supply ditch, so the cutter had to work with great speed before the water ran out.

Gemstone cutting in this manner was a very cold, hard, and life-shortening profession. An individual would start his apprenticeship at the age of fourteen while the bones in his chest were still developing. Consequently the chest cavity became deformed. Lying for several hours a day in this position put great strain on the lungs, chest, stomach, and intestines. Being in a very cold, damp environment and inhaling the dust from the wheel on a daily basis was also

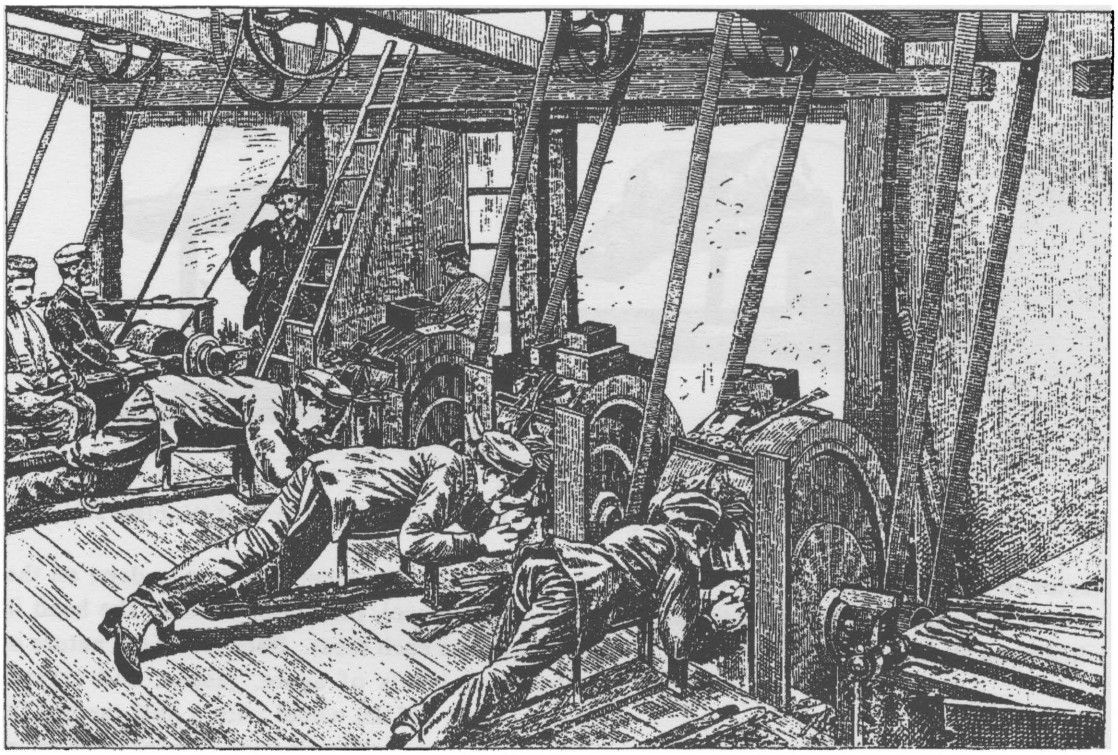

**Figure 10.** Agate cutters at work in Idar-Oberstein in the late 19th century. The majority of the men are cutting gems on sandstone wheels in the traditional manner. At the far left, a man trims a rough piece of agate with a hammer and a small rail. The person next to him is polishing stones (Hisserich 1894:frontispiece).

deleterious to the cutter's health. Tuberculosis was endemic to the Hunsrück region (Roth 1986:160-170).

Another added risk in cutting was having one of the large wheels explode which meant certain death. A flaw might be hidden in the interior of the stone, causing it to fly to pieces under the immense centrifical forces generated by the rapidly revolving wheel (Fig. 11). It is a tribute to the skill and knowledge of the quarrymen and the cutters that only a few such accidents have been recorded during the industry's long history.

For all this, the cutter was paid very low wages, usually on a piecework basis. The result was that the average agate cutter did not usually live past the age of about 40.

## Drilling

Once the bead was formed, next came the drilling process. This was accomplished for centuries using the ancient bow method, a technique that can be traced back to ancient Egypt and one that the Germans, being excellent mechanics, refined to a very high level. The process consisted of turning a drill rod charged with abrasive grit back and forth using a bow powered by hand. It was at least as early as the beginning of the 19th century that the use of two diamond chips set in the drill's tip was adopted in Idar, and part of the skill of being a borer was to be able to set the diamonds in the drill rod. The diamonds used were usually carbonados from Brazil.

It is the authors' experience that when one attempts to drill all the way through a bead from one side, the drill rod tends to drift, often leading to a crooked hole. What distinguished Idar beads from those of other localities was the high development of the drilling technique that allowed the production of a straight hole up to 20 cm in length! Hard gemstone beads from other bead production centers generally followed the more usual practice of drilling the hole

**Figure 11.** A group of cutters with the remains of a cutting wheel that exploded. Such an accident usually resulted in fatalities. The absence of military caps on the workers suggests that this picture was taken before World War I. The death toll on the cutters in that war was much higher than for the population in general since nearly all cutters ended up either in the infantry or the artillery.

from two sides, hoping that the two segments would meet in the middle. These beads usually have a ridge at the point where the two segments meet that can abrade the beading cord. Idar beads generally did not suffer from such problems.

The gemstone driller (*Edelsteinbohrer*) worked at home and generally lived much longer than the agate cutter. During boom times there were as many as 1,000 bead drillers active in Idar-Oberstein (Ruppenthal n.d.:33).

There were two types of hole drillers. The largest number were called *Spitzbohrer*. They drilled holes up to 4 mm in diameter using a steel rod set with two diamonds that were up to 0.5 mm in diameter. The rod was turned by a bow which was about .75 m long and 10 mm thick. The bow cord was wrapped around the rod, and the bow was moved rapidly back and forth with the right hand. A drill press with a long wooden handle (*Schwengel*) that rested in the left armpit of the driller was used to lower or raise the drill by slightly moving the left shoulder (Fig. 12).

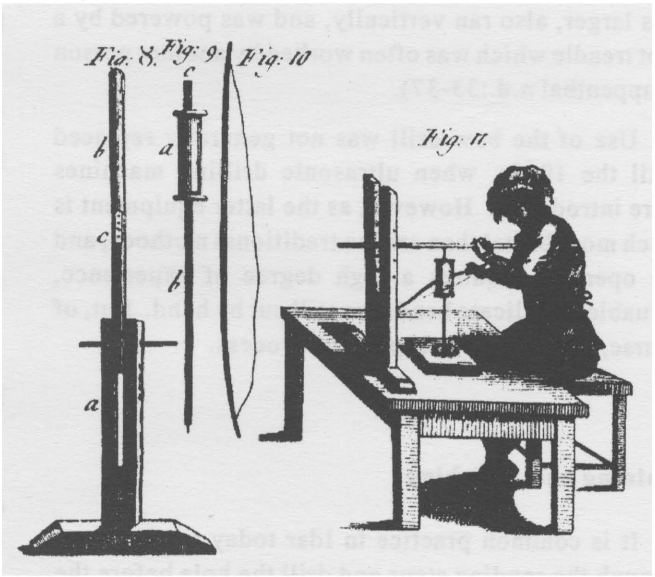


**Figure 12.** A bow driller at work. His tools, illustrated from left to right, are the drill press, the drill, and the bow (Collini 1776:Pl. XIV, Figs. 8-11).

As a first step in the drilling process, an initial depression was made with a special drill bit called an *Anbohrer*. The worker then switched to the main drill. Round beads were glued into appropriate grooves in an iron plate so that when the drill came through, the area around the hole would not spall. Oval beads and those of other shapes that could not be glued down in this way were held in special wooden clamps. Very long holes were usually drilled from either end. In order to keep the drill perfectly straight, its shaft rotated in a hole in an agate block which had many long straight holes of different sizes drilled through it. By choosing the appropriate size hole for his drill steel to pass through, the driller could minimize the inevitable wobble, thus producing a better and straighter hole. Once drilled, the hole was subsequently smoothed and widened using a larger "white" diamond, thus eliminating irregularities which might abrade the string on which the beads were to be strung.

The other type of driller was called a *Röhrenbohrer* (tube borer). He drilled holes from 4 to 100 mm in diameter using tubular core drills. These were made of brass with small diamonds hammered into the leading edge. The *Röhrenbohrer* kept his work immersed in oil to cool and lubricate it. His apparatus was larger, also ran vertically, and was powered by a foot treadle which was often worked by another person (Ruppenthal n.d.:33-37).

Use of the bow drill was not generally replaced until the 1950s, when ultrasonic drilling machines were introduced. However, as the latter equipment is much more brutal than are the traditional methods, and the operator requires a high degree of experience, valuable or delicate beads are still cut by hand. But, of course, this is a more expensive process.

### Staining and Polishing

It is common practice in Idar today to shape, go through the sanding steps and drill the hole before the bead is stained. After the bead is stained it is polished. The cutters believe that polishing reduces the natural porosity of the agate. In some cases, the agate seems to be more brittle after staining. This can be a problem when one is carving something delicate into the stone.

## EPILOG

It is estimated that between 1830 and 1980, more than 100 million agate beads were made in Idar-Oberstein and exported to Africa and the Middle East (Frazier and Frazier 1993).

Electricity was introduced to the Idar area between 1900 and 1905, which meant that gem cutting was no longer limited to the creekside. A lapidary shop could be set up anywhere. A farmer living in a village in the surrounding hills could put a lapidary studio in his farm house.

A major bead boom occurred in the 1920s, and Idar bead production reached an all-time high at this time. America was the principal customer, with Great Britain in second place. When the crash of 1929 came, most New York gem dealers went bankrupt and, since long-term credit was the usual practice, many Idar business were ruined. In the 1930s, Hitler had all strategic businesses moved away from Germany's borders, with the result that companies involved in optical polishing left Idar. This further forced Idar into a deep depression. By the start of World War II, most of the businesses in Idar were closed. It was not until after 1948, that Idar began to recover and start to prosper once again as a center of gemstone production.

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