DRAWN BEADS

In the narrowest sense of the word, the common German term for drawn bead, *Sprengperle*, should only apply to the drawn bead that is "snapped" off (from *Absprengen*) from the raw product (rods, tubes, canes). In general usage, however, the expression *Sprengperle* has been extended to include the bead created by cutting or chopping. The term "chopped bit" (*Hackebissel*) used for *Sprengperle* is in a certain sense, therefore, a contradiction per se, but the terminology has become established all the same. It is more accurate, therefore, to use the term "drawn bead," known in the specialized English literature (Karklins 1985:88).

The primary product is based on the drawing process which has already been described. After the solid rods and hollow tubes or the smaller canes (which can be either solid or hollow) are drawn, further processing begins. The solid rods were intended for mold-pressers or mold-pressing works and were divided for them into appropriate lengths (ca. 1.0-1.5 m); the hollow tubes could sometimes achieve considerable diameters (when they were used for making bangles, for example). The canes of lesser diameter were either tube-shaped (hollow) and thin-walled and thus semi-finished products for the glass blowers who made blown beads, or they were thicker-walled, perforated or unperforated canes. These canes were divided by cutting, chopping, or snapping into separate sections that had to be the right size for the bead to be made. There were several techniques for doing this, but basically they fall into two categories: on the one hand, the method from Murano and Venice which is based on chopping the cane and, on the other hand, the one from Bohemia that derives from snapping off the separate sections.

With most of the rocailles or bugles in the beadwork from the Biedermeier to the Art Deco period (Plates 2C, 10D-11D, 12D, 13C-14B, 15A-B, 16A-B), it is not possible to tell whether Venetian or Bohemian products were used – both were stocked by speciality shops and sold according to demand. Viennese glass bead merchants, such as M. Mayerhofer, offered a "supply of all sorts of Bohemian and Venetian glass beads. French gold and silver and steel beads, an assortment of French and Bohemian hat ornaments and other decorative articles for ladies' hats" (Stehlik 1877-1887: columns 530-531). The Pschikal Brothers in Vienna were similarly well stocked with a large supply "of Bohemian and Venetian glass beads, French gold, silver, and steel beads from the most renowned factories here and abroad" (Stehlik 1877-1878: column 530).

The S. Spitzer & Comp. factory for glass jewelry, beads, and buttons in Gablonz had a branch in Vienna, as did Joh. Wawra & Sons in Morchestern which made "buttons, beads, necklaces, jewelry sets, brooches, earrings, etc." (Stehlik 1877-1878: column 531). Albert Goldzieher had a "factory warehouse for Venetian and Bohemian seed beads and bugles. Glass beads of all kinds. Manufactory of glass and bronze bijouterie, buckles, clasps, and jet hat ornaments" (Stehlik 1877-1878: columns 533, 534).

A year later, Stehlik's Viennese Commercial Yearbook listed the beads of the Albert Goldzieher company in more detail: "Wholesale stock of embroidery and Venetian seed beads in all colors and sizes; of Bohemian beads of all kinds, such as blown, silvered, coral and wax beads, drawn beads, painted; foiled, mold-pressed, and bugle beads; black and colored beads for trimmings" (Stehlik 1878-1879: column 602).

Goldzieher is mentioned again under the heading of glass jewelry, this time for the "manufacture and export of Bohemian glass and bronze jewelry items such as rings, breast pins, necklaces, earrings, medallions, brooches, crosses, ladies' trimmings, etc.; specialities in trimmings for milliners' shops" (Stehlik 1878-1879: column 605).

In his shop in Vienna, F.J. Kittel from Kukan near Gablonz also stocked "beads, necklaces, earrings, brooches, jewelry sets, finger rings, buttons; also hat ornaments such as clasps, hat buckles, corals, prisms, etc." (Stehlik 1878-1879: column 605).

Starting around 1870, more machinery was used in addition to the manual work of processing the glass beads being offered. Examples of this are shown in the privileges awarded to Demzak and Schneider for weaving with beads (Plates 12B, 13A).

Embroidery and Knitting Beads and Bugles from Venice and Murano

Tiny little beads lined up on the thinnest of threads, fastened into sample books or tied in little bunches, are not only precious because of the stunning range of their colors; the Venetian embroidery and knitting beads from the Technical Museum are among the rarest items of the period prior to 1818 (Plate 13B). The very small perforated beads are called embroidery beads in some sources, knitting beads in others. Both terms point to their suitability and use in knit and embroidery work, while those without holes, the "scatter" beads, fulfilled a different purpose. The terms rocailles and ballotini are mentioned in printed sources starting in the second quarter of the 19th century. We know the term rocaille from the history of art; it describes the typical ornamentation characterized by irregular curvature derived from decorative work using pebbles and shells

during the 18th century; it gave the name to the style period Rococo. Embroidery and knitting beads are described by Loysel (1818:313) as "little perforated spheres, keeping to about ¾ lines in diameter, made of transparent and opaque glass, in all the colors and shades of the same, strung on silk or other thread which are used for knitting and portraying all sorts of designs in colors."

The little embroidery beads, called *margheritine* (*marguerites*) have the art of the margaritaio (*margaritaire*) to thank for their creation. Bussolin differentiates between two categories of bead factories (*fabriques de conteries*): the production of seed beads or *conteries fines* (fine beads) and that of rocailles or *conterie ordinaires* (common beads) (Bussolin 1847:8). Finally, Bussolin lists three groups of beads known in the trade under the name *conteries*: 1) the *margaritines* for embroidering, called *charlottes* in the trade; 2) the *conteries* in the actual sense, in different sizes and qualities, generally known under the names *jais* and *rocailles*; and 3) the beads worked at the lamp to be used for making rosaries, necklaces, bracelets, earrings, hatpins (*tête d'épingle*), etc. (Bussolin 1847:31, 32).

In listing the various branches of glass production, Bussolin (1847:5) places the enamel and bead factories (*Fabriques d'émaux, perles de verre coloré, appelées en général, jais, rocailles, ou conteries*) in first place and emphasizes their uniqueness in the entire world. Leng (1835:500) equates knitting beads with seed beads. Altmütter (1841:92) calls the knitting and embroidery beads the best known Venetian beads.

Bugles

Little cylindrical tubes, not rounded off, were commonly known under the term bugles (*Stiften-Schmelz [Cannelloni]*). They mostly had a kind of mother-of-pearl look (made of glass with little air bubbles worked into it) or were black (Altmütter 1841:98, 99). Graeger (1868:121) equates seed beads and bugles (*Schmelz* and *Stiftenschmelz*) and defines them as little tubes from 1 to 6 lines long whose edges are not rounded off. Zanetti made a distinction between *jais*, *pipiottis*, and *macà*. By *jais* he meant more or less long pieces of tubing which were not rounded off and therefore were also called *cruo* or *crudo*. He called pieces of tubing whose edges had been subjected to heat a second time in a drum and thus had edges that were slightly rounded, *pipiottis*; the *macà* were made from polygonal tubes and were related to the *pipiottis* (Zanetti 1874:132). The origin of the term *maca* (*macca*), which was also used in German-language areas, has not been pursued in the specialized literature. In dictionaries it is defined as "amount, plenty, abundance" (Michaelis 1900:452; Valentini 1831, 1:599). According to Tayenthal (1900:21), the *maka* (listed as a product from Riedel) were made from black hexagonal tubing with the chopping machine and freed of their sharp edges in the rounding muffle. On the other hand, *macca* were also understood to be "the simplest beads made from chopped bits (*Hackebissel*), are tumbled dry in a wooden barrel to round off their sharp edges and then polished the same way in water" (Gablonz Archive and Museum n.d.b).

Zanetti distinguishes the quality of the beads as "*fine, mezzo fine, piombo, vetro, nero*" and sizes as "*collane, cannettine, cannette à 3, 3½, 4, 5, e ½.*" The French called the *collane*, *charlottes* or *rocailles*, depending on their size (Zanetti 1874:132). Benrath (1875:348) saw in the "beads, nothing more than short pieces of tube, 'enamels' which often were five to six times longer than they are wide," mostly in black glass, but also colorless and in bright colors, found in the trade under the name *Schmelzen* (*jais*, bugles, seed beads) and still exhibit sharp edges.

> Seed beads are the smallest glass beads in various shapes, colors, and sizes which are used for clothing ornaments, clothing trim, chains, for decorations, in the jewelery-wares industry, or for making into fashionable accessories.... Raw glass beads, so-called "macca," were imported by the ton from Venice. Here in the district they were refined and exported. In addition, producers also bought the tubes and had them broken off and worked on by cottage workers... (Dressler n.d.:1).

> For a long time, the fabrication of the rocaille beads was only undertaken in Venice, but was introduced here in the year 1887 by Jos. Riedel in Polaun and since then they have made them very successfully and with the comprehension that is usual in this company, so that it has become an important competition for Venice... (Gablonz 1898:163).

The finishing of Venetian beads in Bohemia is documented in numerous sources, including contemporary ones. When, in 1793, Schreyer (1793:61) mentions seed beads that are "finished in Meiffersdorf not far from Bohemian-Kamnitz," it is not apparent whether these beads were produced there or only finished there. Schreyer goes into somewhat more detail in 1799 regarding "seed beads" and "Bohemian stones" (Schreyer 1799:308, 309):

> Seed beads. Are partly round, partly oval, perforated glass seeds or corals with which a woman adorns her neck and hands, and if required, also used for all sorts of decoration; they are made of enamel glass in all kinds of colors. These seed beads are brought from Venice raw and here in these parts in the Dominion of Bohemian Kamnitz, in the village

> of Meistersdorf, are cut, of which about 26,400 fl. worth are made there every year.

"Bohemian stones" valued at about 20,000 fl. were finished annually (Schreyer 1799:309). Venetian beads were still processed into the late 19th century; the company of F.A. Hellmich's son-in-law is mentioned as a "Refinery of Venetian seed beads..." (Ackermann n.d. [after 1873]: column 177).

Technology

The Venetian knitting beads have always been considered an important branch of the "small glassmaking art:"

> The little glass tubes 2-3 lines thick were drawn by beadmakers at the lamp, sorted (by means of a metal sheet with slits filed into it with specifically calibrated widths), and divided into the appropriate lengths by a worker with a little hammer on a little anvil with a sharp edge. Sorting according to size is done in sieves. In a vessel, the holes of the little cylinders are filled with powdered coal. The pieces are heated in wide iron vessels with flat bottoms and stirred around until the sharp edges have become rounded. Cooling takes place on iron sheets; stringing is done with slightly curved needles consisting of thin iron wire threaded with fine thread. Stringing the beads by sticking the needles into the beads held in deep bowls was mostly women's work.... I have the preceding description thanks to a well-informed woman and her husband who made a journey to Venice and Murano not long ago and saw the whole procedure, exactly as it is described here (Loysel 1818:303, 306).

In the specialized literature on glass technology and in encyclopedias, mention is frequently made of the Venetian embroidery and knitting beads and their specific manufacture. Keess describes the little "Venetian beads" and makes the first mention of the machine patented in 1820 by the Venetian glass factory owner Pusinich and the new methods used by Longo for heat-rounding glass beads (Figure 48).

Venetian beads were divided into two categories based on size: the *collane* (*margherite*) and *conterie* (½, 3, 4, and 5 pound); *canelloni* or bugles were, according to Keess (1823:899-901), cut but unheated glass tubes. Keess named the following factories as the best in Venice: "Andreas Pitteri, Joh. Bapt. Gaspari, Ant. Grizzi, Michael Angelo Predesin and Molinari; in Murano those of Dal Mistro and Moraria" (sic; probably "Moravia"). Altmütter (1841:92) calls the "knitting or embroidery beads" the best known of all the Venetian beads. He lists the main colors as "brilliant red, pink, ruby, dark and light blue, turquoise, opal and alabaster, porcelain and chalk white, violet, yellow, green, aquamarine, brown, milk white, brick red, nankeen, crystal, black; all these colors in many shades so that some factories supply more than 150 numbers."

The brilliant red beads consisted of overlay glass in white and red: "The inside is namely opaque, milk white, and only the thin exterior layer is bright red glass. Not only are such beads cheaper to make, the white layer underneath also enhances the red color of the overlay" (Altmütter 1841:92). Small white and red or yellow and red overlay beads from the beginning of the 19th century in the Vienna Technical Museum probably came from the collection of Emperor Franz I (Plate 13B).

The *margaritaio* (*margaritaire*) either had his workshop inside a large bead factory or was self-employed and had his own studio. His job included sorting tubes and segmenting them, rounding (*Rondieren*), sorting, polishing, and stringing beads (Bussolin 1847:16). By the 1820s, sectioning the glass tubes manually (chopping) was probably pretty much replaced by a machine invented by Captain Longo (Bussolin 1847:18). Rounding was done either in a pan (*ferraccia*, erroneously found as *ferazia*) heated over fire or, beginning in 1817, in a drum invented by Luigi Pusinich (often erroneously called Bussinich) (Bussolin 1847:19, 20) and improved after that (Figures 48-49). The chopped glass segments were placed in a very fine mixture (called *siribiti*) of lime, coal dust, and a little water and then rubbed in it to plug the holes of the little glass cylinders and protect them during the next stage of the procedure. Sand was added (sometimes also coal dust) to prevent the pieces of glass from melting together, and then the beads were subjected to heat under constant agitation in the pan or the drum.

After being rounded off, the beads were thrown into a container made of copper or iron for cooling. The beads were separated from the sand in a sieve and then shaken vigorously in a sack to free the holes of the mixture used to block them. Sorting according to size was done with sieves; polishing, by shaking the beads in a sack with bran. Finally, they were strung with very fine, long needles and put together in bunches (*masses*), which varied according to the size of the beads: embroidery beads (*margaritines à broder*) were done up in bunches of 120 strings, five inches in length (Bussolin 1847:19-25). Altmütter (1841:95) describes the mixture as a nonfusible powder made of "plaster and graphite, or of aluminum oxide and charcoal." Graeger (1868:119) names a mixture of sand and ashes or finely pulverized clay; Benrath (1875: 350), a slightly dampened mixture of pulverized coal and lime for filling the holes, and pulverized coal and sand

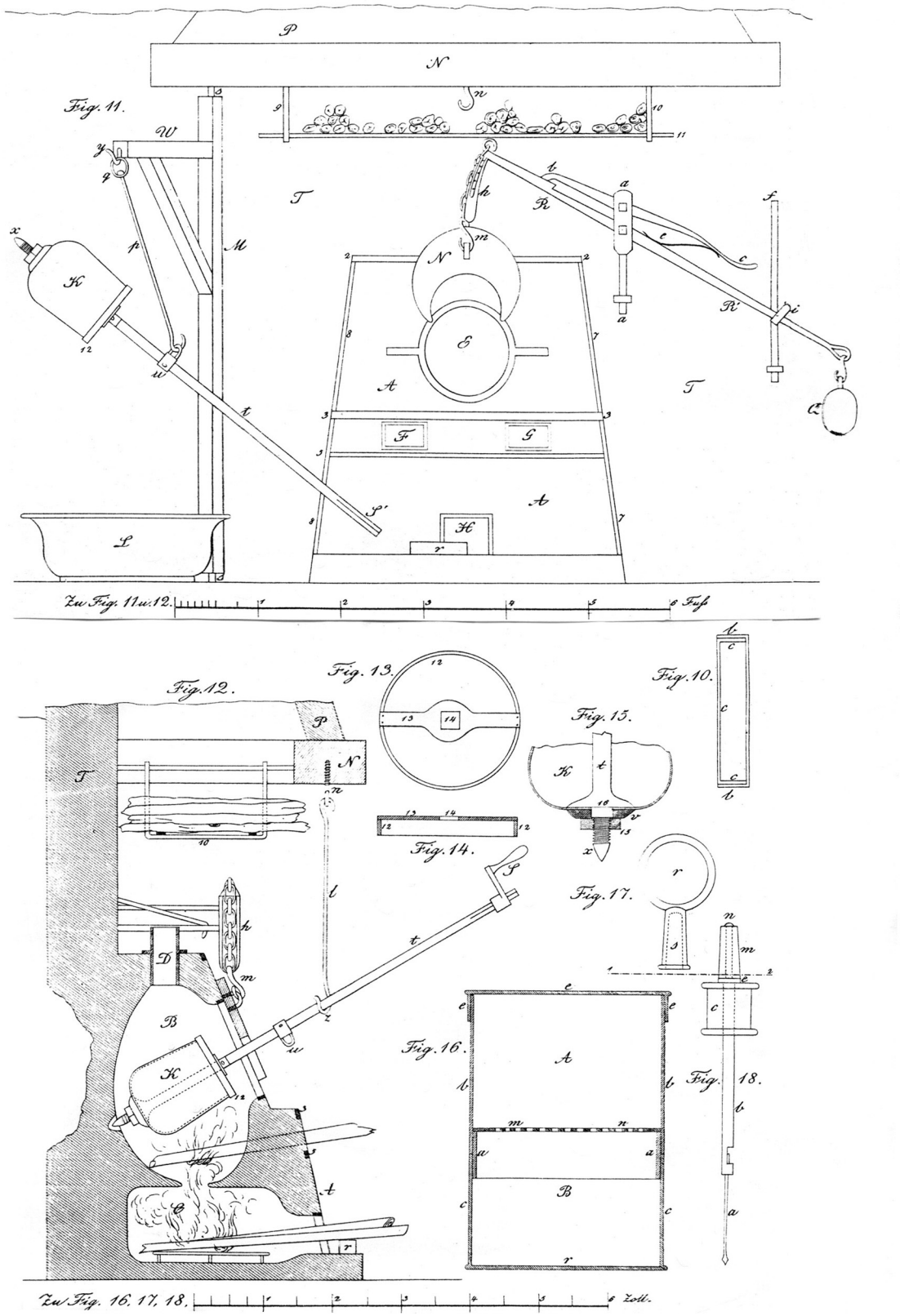

Figure 48. "New apparatus for rounding beads," probably after a privilege of Pusinich (Prechtl 1841, 11, and volume of illustrations, Plate 231).

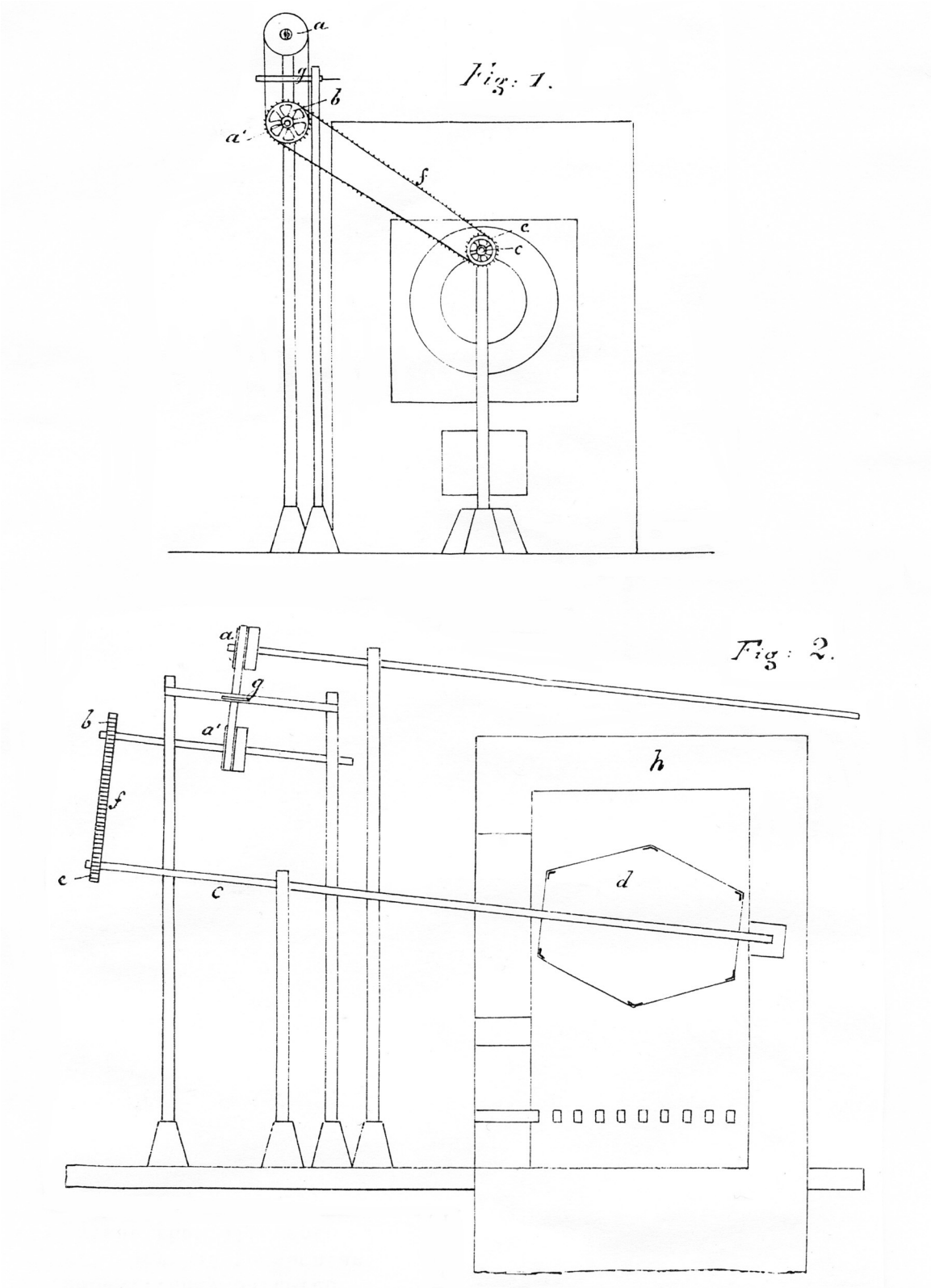

Figure 49. Machine for rounding beads, 1896, Luigi Millin, Venice, privilege no. 46/396 (Austrian Patent Office, Vienna).

as a mixture "to keep the softened beads from melting onto each other."

> Already in the Middle Ages and still today, the embroidery beads were made from thin glass tubes on the island of Murano near Venice. In Venice, glass tubes of close to 200 colors and shades were made in a thickness that was exactly the width the future beads were to be. These glass tubes are brought in bundles to a cutting bench to be cut, very much like chaff, with a rough sharp blade into pieces somewhat shorter than their diameter. Then they are mixed with clay and coal powder and placed in an iron cylinder which is slowly turned over a fire. This causes the beads to become soft and lose the sharp edges that would very quickly cut through the embroidery threads. The finished beads are separated from the pulverized clay and coal by means of a sieve, and then, to give them more brilliance, shaken with bran, sifted again, and strung onto threads (Loth 1859:72).

Good illustrative material can be seen in the *Campioni di perle de Vetro scanelate...* by Giuseppe Bassano, who received a privilege for his method in 1864 (Plate 10C). The tubes for the rocailles (*Schmelzen*) were cut with a kind of scissors, whereby one blade with the edge upwards lay horizontally and was fastened; the second blade, on an elongated lever arm, was moveable. Another apparatus similar to a chaff-cutter could also be used (Benrath 1875:349).

Privileges for Rounding Beads

Until 1817, the pieces cut from tubes were rounded in a pan (*ferraccia*). In that year, Luigi Pusinich was supposed to have invented a new method using a drum (Keess 1823:900). Over the following decades, the rounding process was improved again and again. On 4 June 1821, Captain Marino Longo in Venice received a privilege "for the invention of a way different from previous methods to round glass beads and give polish to the color" (lapsed in 1824 because of unpaid fees):

> The device in which the patentee undertakes the rounding of the beads consists of a hollow cylinder of fired clay which is closed on both sides with truncated cones of the same material. These three parts, held together by an iron frame, are situated on an axle with a crank. The beads are placed in this clay vessel and placed horizontally in a furnace built especially for this purpose, turned for a long period until the beads are polished on all sides and have become perfectly round (Patents 1841, 1:7).

Ludwig Mengardi, however, still used the pan in 1824. On March 30 of that year, he was granted a privilege "for the invention of a furnace for the fabrication of glass beads" (expired in 1829):

> In regard to the special equipment of the furnace and the construction of the vessel in which the chopped glass canes are made into spherical or bead shape, the essentials are as follows: the furnace has several openings, one of which is used for admitting the pan, the others partly for heating, partly for drawing in air. The pan has rounded walls all the way around which are shaped like the segment of a circle. A handle with a crank, attached to the pan, protrudes from the furnace and is used to keep the pan in a rocking motion (Patents 1841, 1:8).

The privilege granted to the Venetian glasswares producer, Giuseppe Zecchin on 25 March 1837, "for the invention of furnaces with two hearths for rounding glass beads," was already rescinded in 1838 for non-payment of fees:

> These furnaces have the well-known oval shape inside and in front do not have a vertical but a sloping wall in which two circular openings are placed for admitting the clay vessel with the beads. The latter hangs from a rod on a little crane which can be turned as far as the furnace opening. When the vessel is in the furnace, a sliding lid, which has an opening in it for the pole of the former, is lowered. Below the aforementioned furnace opening there are the openings through which the fuel is inserted and beneath these the openings for the ashpit through which the draft enters. The smoke is drawn off by four flues (Patents 1842, 2:64).

"For an improvement in the production of beads" is the wording in a privilege that the Venetian glasswares producer, Ludwig (Luigi) Pusinich received on 29 July 1830. It was extended for two years in 1833, and again in 1835; it expired in 1837:

> The purpose of improving the privilege consists in giving the glass a high polish and vitality of color, and a perfectly rounded shape to the individual beads, while saving production materials and labor. He places the beads in a clay vessel shaped like a truncated cone which is attached to a long iron rod, and which is placed in a slanting position in a furnace, and while being heated is turned by a handle attached to a pole (Patents 1841, 1:9).

On the very same day (!), namely 25 March 1837, Ludwig (Luigi) Pusinich and Joseph (Giuseppe) Bellandis received a three-year privilege "for improving and perfecting the tubes for rounding glass beads" (expired in 1840):

> This tube made of cast iron is placed in the furnace in a way so that it can be easily turned from the outside. In order to turn the beads with greater perfection the rod, which rests in a depression in the floor of the tube and which has several side arms, can also be turned by hand (Patents 1842, 2:65).

The illustration published in 1841 goes back to Venetian processes (Figure 48). On 7 December 1836, Giuseppe Zecchin, a "glasswares and enamel producer" in Venice, received a privilege "for the invention of a vessel to reduce the coal required to produce glass beads" (Patents 1845, 3:77). The privilege granted to Pietro Bigaglia, Venice, was valid from 1837 to 1842:

> The improvement which the patentee claims, consists in the fact that he has the vessel used to hold the beads for rounding made of iron, whereas it is usually made of copper. Besides having a low purchase price, such vessels last for a very long time and have a low weight, which means that the workers work for less pay because of less effort. Since the metal is not as thick, they are heated easier and therefore allow an acceleration of the work and a considerable saving in fuel (Patents 1845, 2:191).

Jos. Riedel of Polaun registered the process "for making common quartz or sea sand usable for rounding glass beads" for a privilege. Whereas, according to Josef Riedel, only Venetian sea sand had been used for rounding, he discovered that common quartz or sea sand was also suitable if dolomite, magnesite, and raw lime were added. Precise adjustments in the amounts were made for the various types and colors of beads. Luigi Millin of Venice had a "machine for rounding beads" privileged in 1896 (Figure 49); its special feature was a drum mounted on a shaft, into which the beads were put and set into rotation; the beads were ground and rounded by rubbing against each other and against the walls of the drum; the drum could also be heated.

Drawn Beads in Bohemia

"Bohemian beads are not made by cutting or chopping, but because they are usually larger, by snapping them from colored glass tubes" (Altmütter 1841:105, 106). In the process, a scratch is made in the little tube with a file, a hard ground steel plate, or a diamond point, "after which the individual pieces separate easily, either by pinching them off with tongs or by heating them and then bringing them into contact with a cold object" (Altmütter 1841:106). This was probably the simplest, albeit most expensive, method. Usually a kind of grinding machine (*Sprengzeuge*) was used. In Bohemia, beads were cut or snapped off at work benches (Figures 50-52) operated by hand (*Handzeug*) or those driven by a treadle (*Trempelzeug*, *Trämpelzeug*); later electrical energy was used.

We have documentation from the Biedermeier period showing four stages of a work process, progressing from the cane to the snapped, then cut and polished bead. On the one hand, bunches of strung canes or beads (Plates 17C-18A), on the other, strings of bugles or beads (Plate 17B) which are described more accurately by remnants of the paper labels that belong to them. The documentation of the hexagonal bead of amber-colored glass reads as follows: "Glass bugle, snapped beads, unpolished and polished beads à 3 (facets)." Round beads of crystal glass acquire a certain color effect from the pink thread: "Glass bugle, snapped, polished, cut, unpolished and polished beads à 5 facet[s]."

Figure 50. Pearl grinder (Parkert 1925:145, Figure 21).

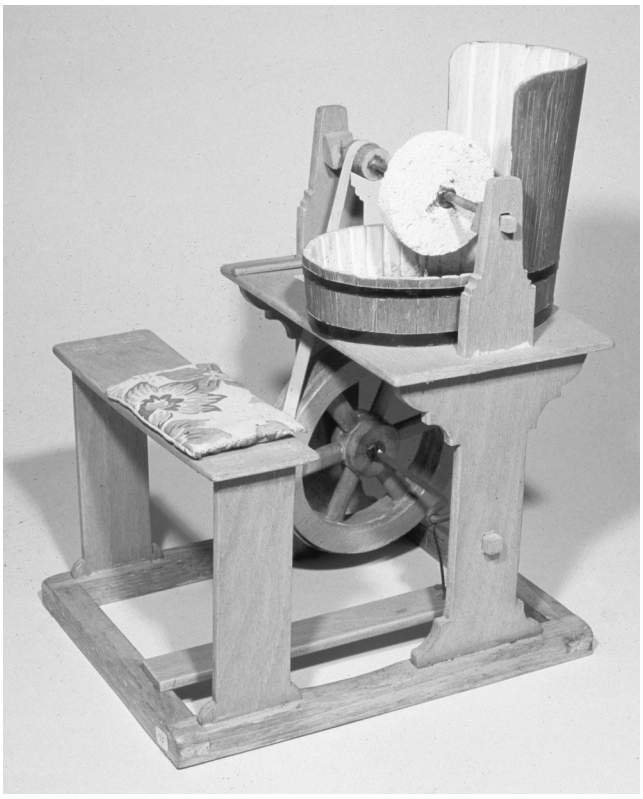

Figure 51. Model of treadle device (foot-driven grinder) (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

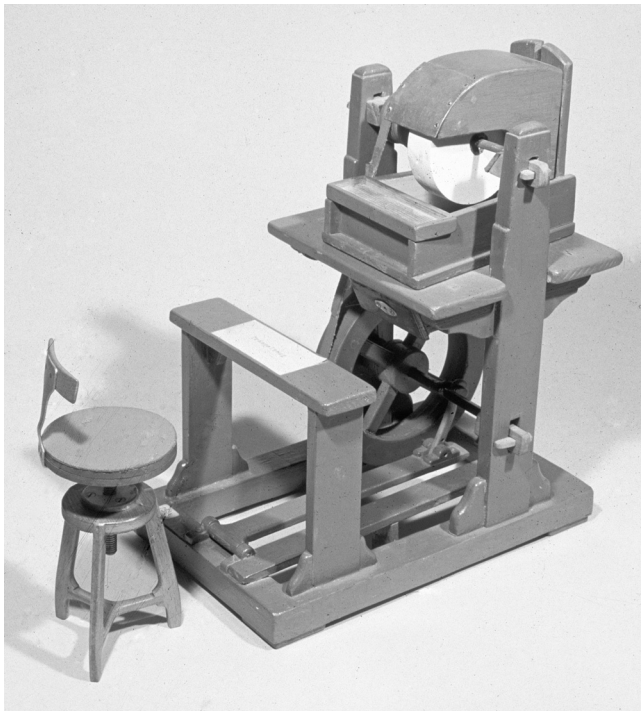

Figure 52. Model of treadle device (foot-driven grinder) (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

Beads were snapped off at the "snapping wheel" (*Sprengscheibe, Sprengrad, Schneidescheibe*). According to Parkert (1925:143), a "wooden frame with a flywheel and a vertical snapping wheel of stone" was used; according to Benda (1877:284) the production of drawn beads proceeded in this manner:

> ... hollow glass canes were broken into little pieces by means of a rotating knife-edged stone wheel. Beads made like this are either sold in this raw state or are transformed into better categories by heating and cutting; they are then called melted [*Schmelz*], double-melted [*Doppelschmelz*], 2-cut, 3-cut, 5-cut faceted drawn beads."

Lilie (1895:166) describes the process as follows: "The drawn beads are made by snapping off little pieces from hollow, usually very thin, glass canes at sharp, vertically rotating stone wheels...."

The application for a privilege by Strauss in 1889 also contains a description of this procedure: "The process commonly used up to now for making glass beads consists of the so-called snapping-off of glass tubes; i.e., by holding the glass tubes against a moderately fast-turning, sharp-edged, revolving sandstone, the so-called snapping wheel" (privilege 39/1892). In 1900, Winter (1900:91) reported:

> The earlier bead snappers sat at their cutting wheel turning on a horizontal axis and put into motion with their foot, and broke off bead after bead by cutting them off the thin, hollow glass cane. In the border area of the language region, I still ran into a remnant of former times, an old bead snapper who was bypassed by the quickly passing time instead of being caught up by it. At best, he can break one kilogram of beads in a day... working 14 hours a day, he can finish 4,000.... The few other manual bead snappers the same supplier engages are paid only seven kreuzer per thousand....

According to Tayenthal, ever since the 1830s, the drawn bead was one of the main articles of the entire bead industry. The expression used by him, and by other sources as well, "*coupé* bead," is probably taken from the French and refers to the same bead commonly termed "Bohemian bead" in handicrafts publications of the time. The use for grave wreaths, lighting fixtures, and bell pulls also supports this assumption (Tayenthal 1900:20). The synonymous use of "snapped" or "*coupé*" beads by Simm & Co. in Polaun appears to me to be characteristic of this (Arnold 1909:89).

A historical retrospect shows that the "snapping-off" of beads (at first only round, not sharp-edged) was already

well known by the end of the 19th century in Morchenstern (Benda 1877:284; Posselt 1907:1). After the death of Anton Posinke of Morchenstern in 1812, his widow married a certain Urban from Beran near Zasada that same year. Urban took over the Posinke business and conducted drawn bead production in the Labau area. Drawn-bead production was also represented in Neudorf (Benda 1877:184). Lilie called Neudorf and Morchenstern the centers of drawn-bead production, with Gablonz next to them. During Lilie's time, however, this technique was hardly found any longer because of the "extremely depressed prices," although it was still widespread in the Semi and Starkenbach districts and in Czech areas (Lilie 1894:166). Lilie probably was referring to work done at the manual or treadle benches, since the so-called "bead-snapping machines" introduced toward the turn of the 19th century in the Gablonz district created an extensive drawn bead production (Figures 53-56), which Lilie (1895:166) also points to: "Since more recent times, the snapping and cutting of beads is also done with machines made after Venetian models."

These so-called "snapping machines" using the Venetian system, introduced into Bohemia towards the end of the 19th century, actually used a chopping process, which is not the same as the original "snapping" process. Around the turn of the century, these "snapping" (in the sense of "chopping") machines were put to use by a number of companies, as we know from Winter:

> ... the Hübner factory... in the last room the size of a small chamber stood three snapping machines, each operated by a woman. Whereas the old machines broke one bead at a time from a rod, here 40 to 50 rods all at once go through a comb, behind which the guillotine awaits them; it rattles up and down in a hurry, 70 to 75 times a minute! And exactly as often, a knife beheads the 40 to 50 rods. The usual hourly capacity of the machine amounts to 225,000 pieces, the highest hourly rate of a hand breaker only 3,428 pieces. The machine accomplishes 50 to 60 kilograms in ten hours, the hand snapper makes 1 kilogram in 14 hours... today there are five snapping machines at Hübner in Gistei, three at Juppe in Labau, 25 at Breit in Wiesenthal which was considered the main offensive at the time, and 38 to 40 at Riedl in Polaun. Currently 42 of these 73 machines are in operation... (Winter 1900:91, 92).

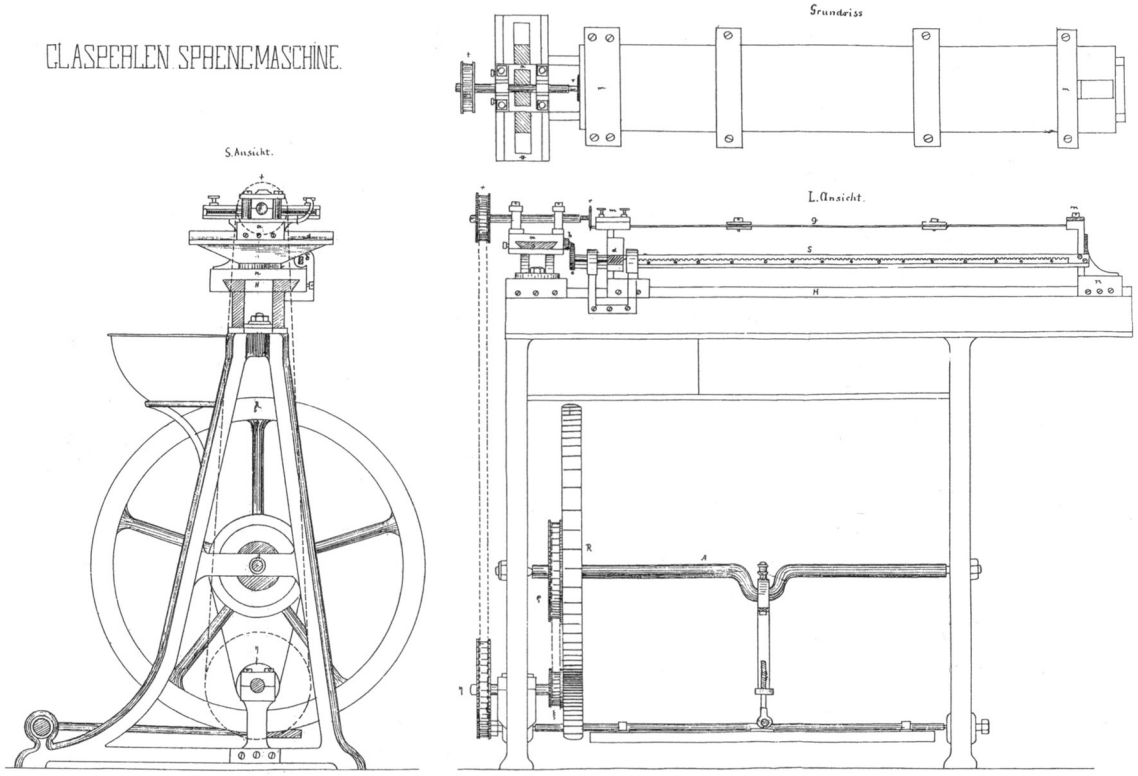

Figure 53. Machine for breaking off glass beads, 1877, Adolf Schindler, Vienna, privilege no. 27/112 (Austrian Patent Office, Vienna).

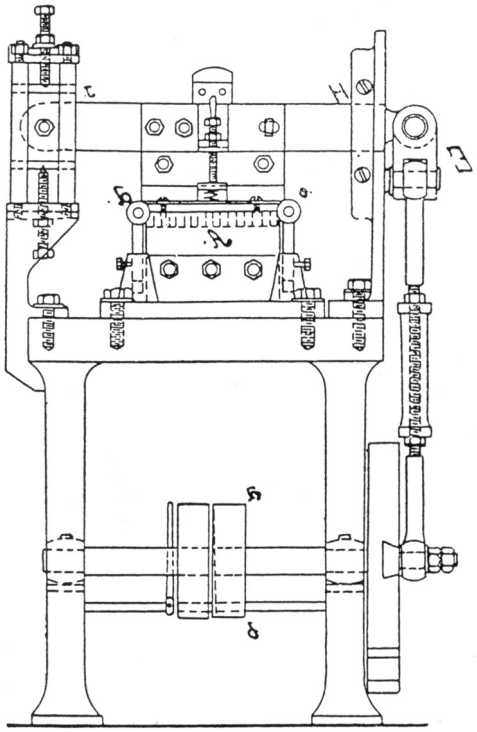

Figure 54. Machine for breaking off glass beads according to the "Venetian system" (Parkert 1925:147, Figure 32).

Surprisingly, the snapping and pinching machines registered for privileges in Austria have practically not been mentioned at all in the specialized literature. In the year 1877, Adolf Schindler, "graduate engineer" from Vienna, registered a "glass-bead snapping machine" with a fly-wheel kept in motion by foot (Figure 50). Using an adjustable device and a cog wheel, the length could be set as desired. Schindler called the following an innovation:

> 1) The fact that a worker does not cut only one rod as before but 30-40 at a time means that much larger quantities can be processed in the same time and with the same labor.
>
> 2) That the glass beads must all necessarily turn out the same size, while this was not the case, nor could even be, using previous manual methods.

Bead-breaking machines after the Venetian system were introduced into Bohemia towards the end of the 1880s. According to Dressler, Josef Riedel, Jr., brought a glass-chopping machine back to Polaun with him from a trip to Venice in 1886. Italian families were engaged to set up glass production. In 1888, Riedel built a glass-bead factory in Przichowitz which had a daily capacity of 10,000 kilograms (Dressler n.d.:1,2). In 1888, Ludwig Breit also set up a chopping machine with the help of his foreman, Wilhelm Kaulfuss, who had gathered experience in Venetian glass factories. In time, Riedel managed to operate no fewer than 16 machines of this kind (Dressier n.d.:2; Parkert 1925:146).

In his memoirs, Ludwig Breit writes about the "snapping works:"

> As far as I can remember, there were 11-12 snapping machines standing there, which were supplied by the Rudolf Feix company in Bad Schlag. The canes were fed through rubber cylinders across a toothed bottom knife and, with a quick downward motion from an upper knife, were snapped (chopped). The bottom knives were made of steel and, to suit the particular width of the glass, were grooved so that every stroke of the upper knife hit the rod at 3 different places. We got the upper knives before the two wars from a company in Sheffield in England; they were made entirely of steel and had to be sharpened frequently... (Breit 1987-1990:68).

It seems worth mentioning that Kaulfuss received a privilege in 1892 for a "machine for making glass beads" (Figure 56a-b) which cut the glass rods by means of a knife that moved up and down. Whereas Schindler's machine was really still one that broke beads in the strict sense, the privilege registered on 8 May 1888, by Jeiteles Sohn in Gablonz, was more of a cutting machine. It consisted of two main parts, a pinching and a feeding device (Figure 55). Three circular, concentrically placed cutting wheels were pressed against the glass rods and "pinched" the glass rods lying in the center of the device into the desired length. In 1890, Riedel built a new rounding works in Przichowitz with eight rounding furnaces. By 1901, 15 furnaces were already in operation. With the help of Master Gürtler Kittel, Riedel constructed a threading machine. By 1902, 128 women were working in three shifts at 16 machines (Dressier n.d.:3).

In an eight-hour working day, one worker finished 40-60 kilograms of glass at one machine, but was able to operate two machines simultaneously (a total of 120 kilograms per workday). A worker snapping the beads by hand was only able to produce 1½ kg of beads a day. On 29 January 1890, there was an uprising of glass-bead workers in which machines and bead stock worth more than 40,000 kreuzer were destroyed (Parkert 1925:146). Dressler, Hrdy, Winter, and Tayenthal are chroniclers of this uprising.

Stringing the tiny beads was done by hand for a very long time. Schander reported on this stringing:

> Skilled women created a special method for getting these little beads onto the threads. A flat wooden bowl of about 20 to 30 cm was filled with as many of these smallest beads as were needed; the women held two to three long but very thin needles in each

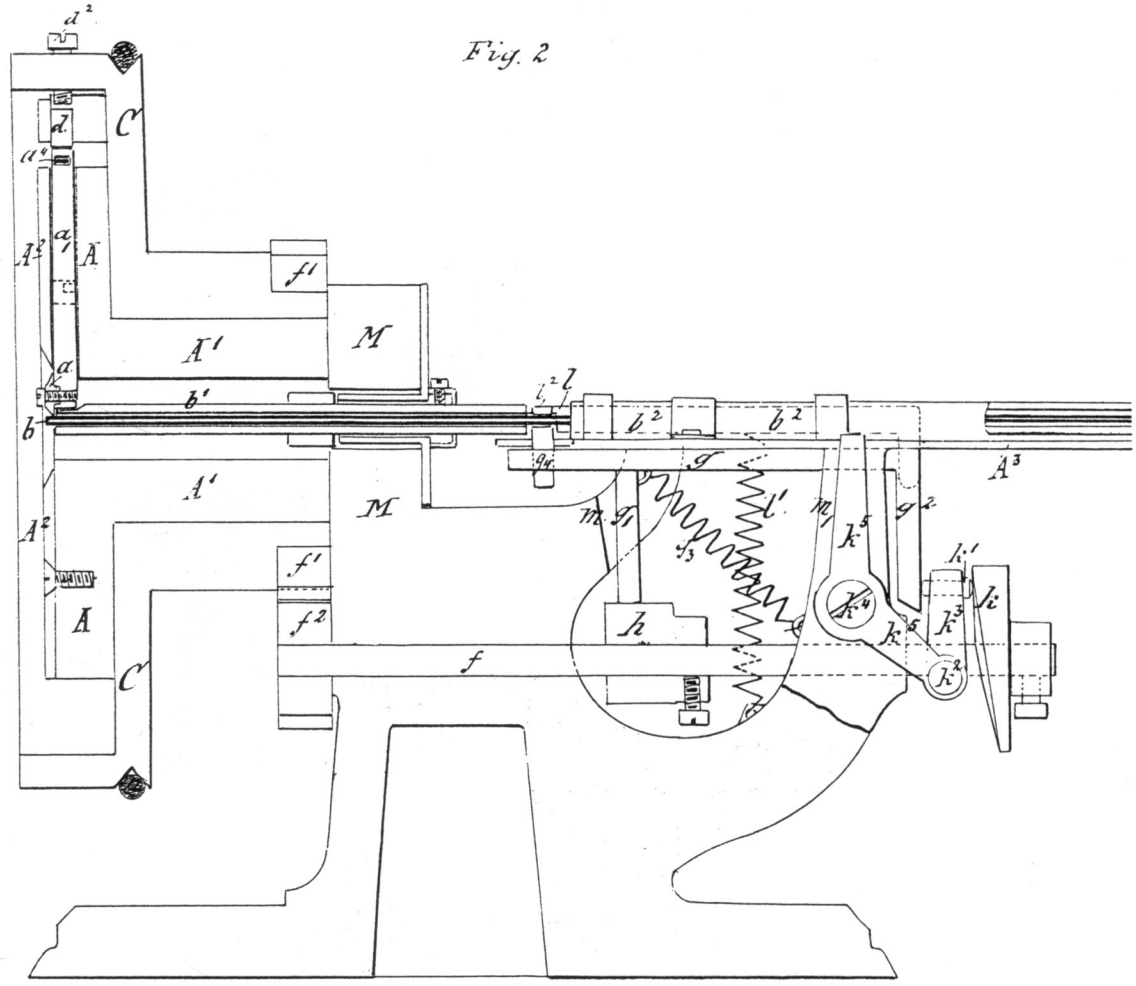

Figure 55. "Pinching" machine for cutting off beads, 1888, Jacob H. Jeiteles Sohn, Gablonz, privilege no. 38/2604 (Austrian Patent Office, Vienna).

> hand; they constantly pushed them through the heap of beads until the needles had taken on enough beads. The beads were pushed from the needles onto the threads (Schander [1954]:9).

The large quantity of the beads made every day by the machines still had to be strung. The former manual process of stringing beads onto threads was partly replaced by machines. Altogether, I know of five privileges for "stringing machines" from the late 19th century: those of the companies W. Klaar in Gablonz, 1887 (Figure 57); Jos. Riedel in Polaun, 1891 (Figure 58); Julius Krause in Wiesenthal, 1894 (Figure 59); Johann Ullmann in Tannwald, 1896; and Josef Dolenský in Jesený-Engenthal, 1897 (Figure 60). It can be assumed that bead producers did not give up manual stringing altogether, especially since, most likely, only the big companies could afford to use stringing machines, a use that was not accepted without resistance and criticism.

In the Technical Museum in Vienna, hexagonal "bits" are preserved which point to the Riedel bead-breaking machine in date and description and are therefore of historical value (Figure 61). Samples of ballotini from the Riedel production are also in the collection (Plate 12A). At the German-Bohemian Exhibition in Reichenberg, "rounded rocaille beads and the ballotini – the scatter beads – were represented..., strung on threads, that is, ready for shipping, also made into embroideries and wreathes" (Tiedt 1906:1402). In the *Centralblatt*, this type of bead, among others, is mentioned in more detail, with the products from the Riedel bead factory in Przichowitz being remarked upon especially:

> A number of showcases held rounded beads (rocailles) of striped and opaque glasses for embroideries, beads and little drawn tubes, cut rounded beads, internally ribbed round beads, faceted and

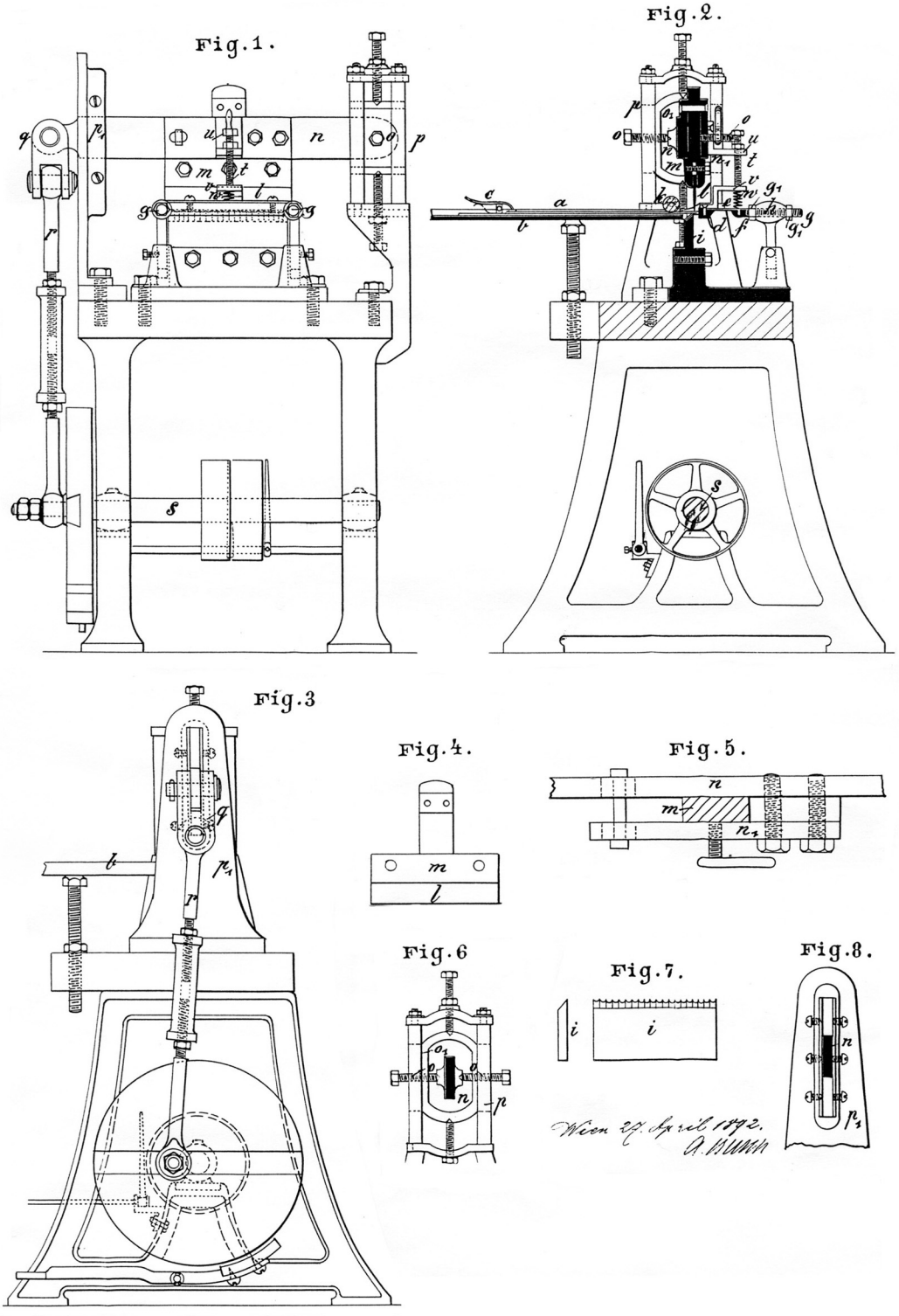

Figure 56a. Machine for making glass beads (Part 1), 1892, Wilhelm Kaulfuss, Goerlitz, privilege no. 42/4130 (Austrian Patent Office, Vienna).

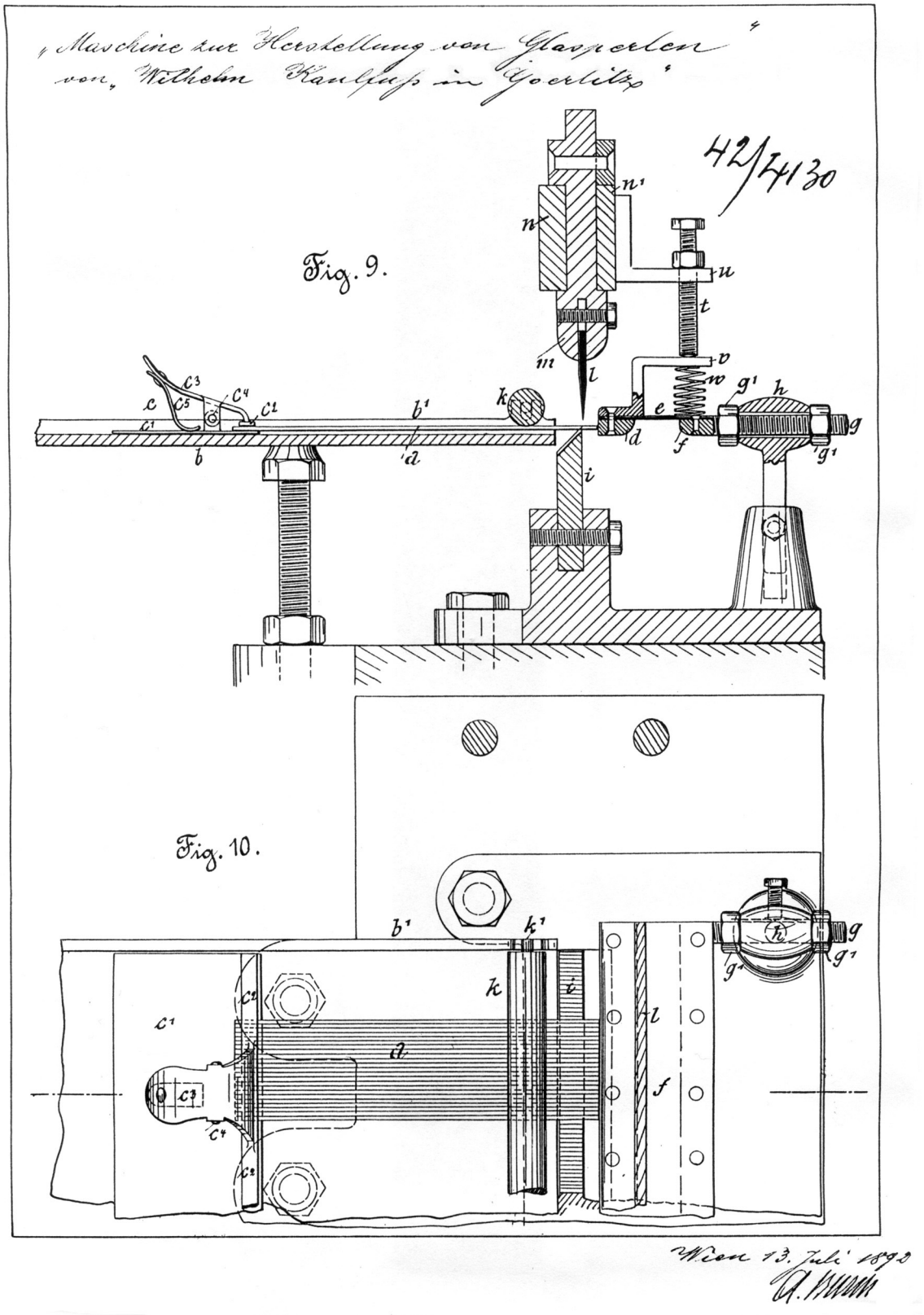

Figure 56b. Machine for making glass beads (Part 2).

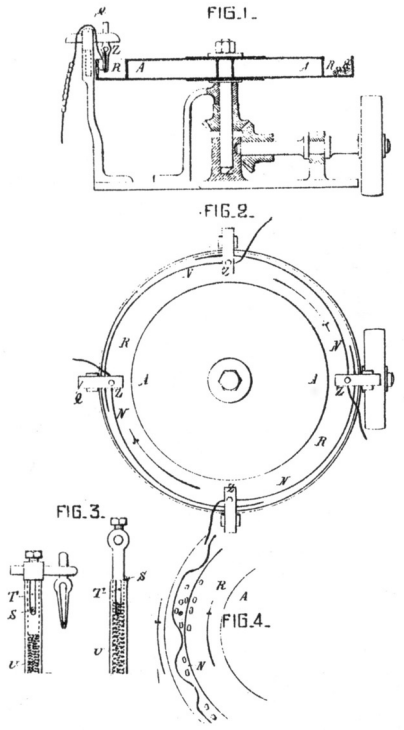

Figure 57. Threading machine, 1887, W. Klaar, Gablonz, privilege no. 37/2442 (Austrian Patent Office, Vienna).

cut beads in attractive arrangements. Among the rounded embroidery beads for the Orient, the innumerable shades of color are very admirable; the faceted beads for passementeries are remarkable for their softness, their shades of color especially suited to their use; the rounded beads for grave wreaths in opaque and transparent glass are stronger and more brilliant in color. An interesting article are the solid tiny glass balls (ballotini) made by the Przichowitz bead factory; in an infinite number of size gradations from the size of a grain of shot down to the finest grain of dust, in all colors and shades of colors, they are an important export article to Thuringen, to use for making brilliant Christmas tree decorations and other decorative items and were also used for a while for making colored postcards... (Schindler 1906:1719).

Before the Second World War, rocailles were made in Venice and Bohemia, and also in France. After the war, the Ludwig Breit company equipped the Wiesenthalhütte in Schwäbisch-Gmünd for beadmaking in a grand style. Up to a few years ago, the Riedel company in Austria still made rocailles (Plates 14C-D); today this branch of production is shut down.

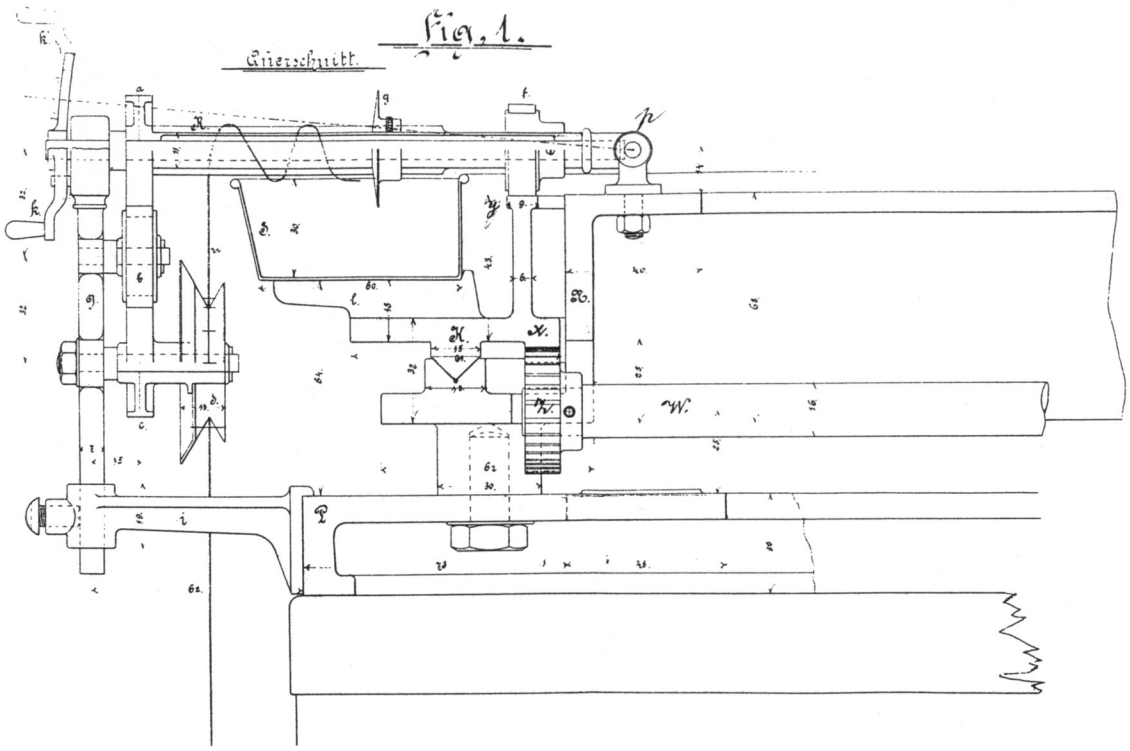

Figure 58. Apparatus for threading beads, 1891, Josef Riedel, Polaun, privilege no. 41/1891 (Austrian Patent Office, Vienna).

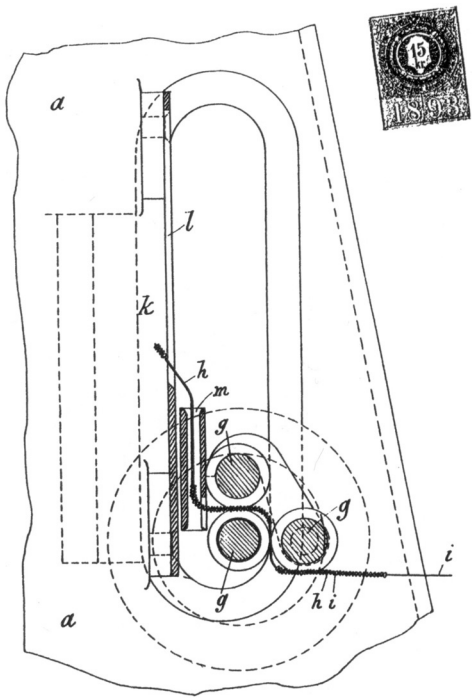

Figure 59. Bead-threading apparatus, 1894, Julius Krause, Wiesenthal, privilege no. 44/2785 (Austrian Patent Office, Vienna).

Cutting

Both solid beads and blown beads with thicker walls can be further processed by means of cutting. The techniques of grinding and cutting glass have always been located in the north. In the Venetian factories, bead cutting was carried out "only on smaller devices set in motion by the worker's hand, whereas this is done in a big fashion in Bohemia with special water mills" (Altmütter 1841:105):

> Venetian beads frequently go to Bohemia to be ground and faceted. This is even done with the finest knitting beads which also acquire their facets this way (even though, with their small size, the facets are not completely uniform) and then become a new commercial article the two distant countries both have a part in (Altmütter 1841:107).

Charlottes taillées was the name given to irregularly cut Venetian embroidery beads. These were "the smallest and most valuable beads in a rich assortment of colors" (Gablonz Archive and Museum n.d.b).

> One fastens several tubes of the same thickness together with wax or some sort of pitch at both ends onto a board 2 inches wide so that they lie

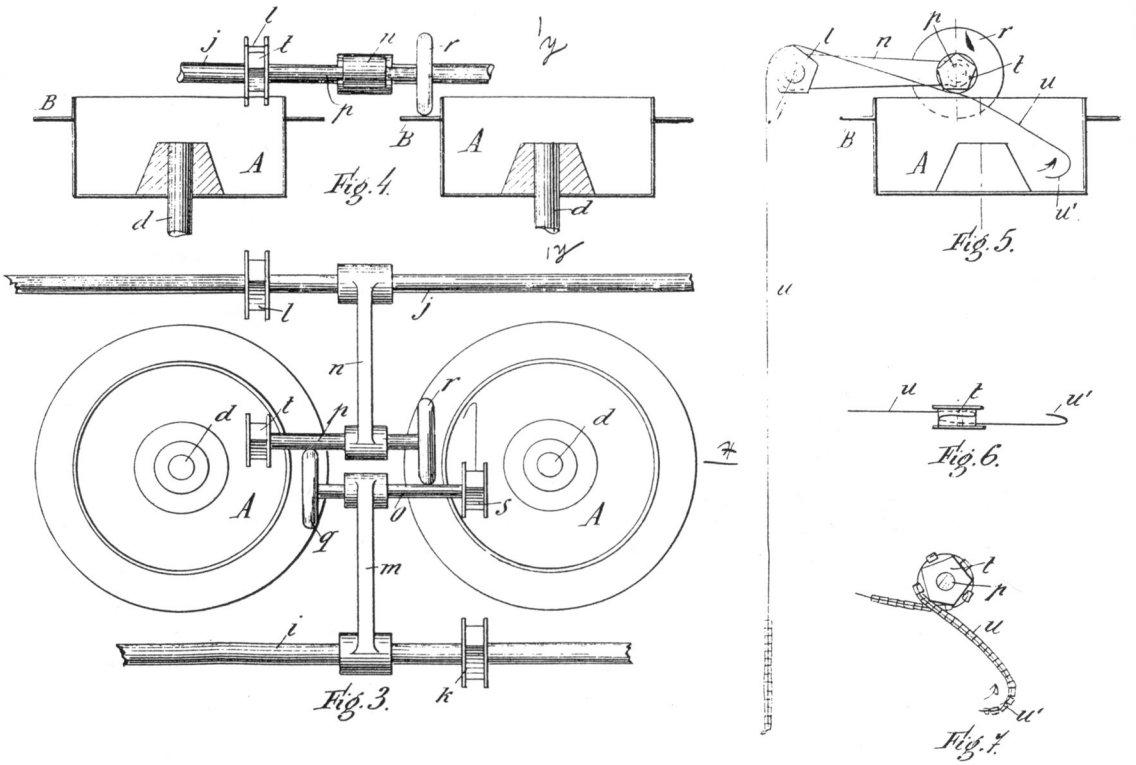

Figure 60. Machine for threading glass beads, 1897, Josef Dolenský, Jesený-Engenthal, privilege no. 47/5365 (Austrian Patent Office, Vienna).

Figure 61. Hexagonal glass tubes and beads cut from them, Josef Riedel, Polaun, 1894; frame 16.2 x 12.1 cm (TMV, TM 7716/21).

> close together; then holds the tubes, together with the board, against a rotating wooden disc coated with emery and moves the tubes lengthwise evenly back and forth, thus creating a narrow flat surface on all the tubes. Afterwards one polishes them with stannic oxide on a tin disc using the same motions as with the emery disc. Now remove the tubes from the pitch, turn them a little on their axis, and in this position grind and polish them again. Finally remove them from the pitch again and turn the tubes a little so that a third surface is ground and polished. These three facets are usually sufficient, but one is free to make as many as one sees fit. Such faceted tubes are now cut, rounded off and strung, then they have the appearance of finely cut garnets (Loysel 1818:305).

Beads can be cut by fastening several round tubes with pitch "parallel and close together onto a board and worked together, or also by grinding them in a groove in a hard surface, one after the other" (Graeger 1868:120). The simplest cutting devices were the hand-held ones (*Handzeuge*) like those commonly used in Turnau. Here the artistic cuts on stones were achieved with so-called "quadrants." Among the most beautiful Gablonz examples of cutting from the Biedermeier period are the beads of a Gablonz necklace which shows each bead in a different type of cut (Plate 18B). In Gablonz, larger stones were easier to cut in cutting mills and even the "small work" was soon done there, too. Kukan was another stone-cutting center beginning in the last quarter of the 18th century. Using pedal-driven cutting benches ("treadle apparatuses"), they cut extremely small stones (*carmoisiere*). The composition producers and glass merchants from Liebenau also turned to the stone cutters of Gablonz and soon stone cutting was also introduced into Reichenau (Benda 1877:278 ff.).

> Also in regards to the cut, the shapes of precious stones have generally been retained. The most usual shapes are carmoisiere, rosettes, rhombuses, oval rosettes, squares and long rectangles with sharp or blunted edges, triangles, drops, pointed ellipses, etc. These are sorted into categories according to their cuts and one differentiates between two-, three-, four-, five-fold beads; rhombic, semi-rhombic, or step-cut stones... (Benda 1877:279, 280).

The number of rows of facets is designated by the terms two-cut, three-cut, etc; according to Posselt, the "two-cut beads" were characterized by the somewhat irregularly cut edges of the broken bits. Posselt also calls the two-cut beads "screws" (*Schrauben*). According to his reports, they were placed for a while in a box containing a grinding plate and were ground (Posselt 1907:3, 10, 11). "Three-cut beads" resulted when the broken bits were ground once uniformly, according to Posselt. There were also five-cut and seven-cut beads (Posselt 1907:3). In another place, Posselt (1907:9) states that the two-cut beads were made in the same way as three-cut, except that none of the edges were cut, only ground round on a mandrel. According to Posselt, the glass used to make the smaller black two-cut and three-cut beads was first drawn round and then cut to a hexagonal shape in the grinding mills. These tubes (called *Stajgl*) were cut apart at treadle apparatuses and placed on a mandrel or a device with a pin and ground so that every edge is cut off uniformly towards the hole at both ends of the bead. A contemporary source explains the "two-cut" and "three-cut" beads:

> "Two-cut beads" are made from six-sided glass, ground and polished. The grinding is not done by hand for each single bead, but rather in a wooden drum filled with water, in which a grindstone turns vertically in the opposite direction with revolutions

that are not too fast. This causes the beads to lose their sharp edges while retaining the facets. The beads are then well cleaned and dried and put into the fire on a fire-clay plate. Slight melting on the glass surface gives them their brilliance. "Three-cut beads" are made by taking chopped beads (*Hackebissel*) made from six-sided glass, strung onto brass wire, and pressing them against a rapidly turning grindstone three times (Gablonz Archive and Museum n.d.b).

The glass cutting was – according to Lilie – performed in many cutting mills at "wheel benches" with vertically or horizontally rotating wheels or discs of iron, stone, or wood. The wheel benches were mostly leased to the glass cutters by the owners of the mills (Lilie 1895:166-167).

Towards the end of the 19th century, the cutting works for buttons, crystal wares, and glass stones were dominant in the Gablonz-Tannwald district. Glass stones were also cut in the neighboring Czech areas where "bead cutting has its sole seat" (Gablonz 1898:164).

The cutter worked at the treadle apparatus or at a water-powered wheel bench, a workplace the cutting mill owner usually avoided. Models of hand- and treadle-operated apparatuses illustrate this technique and also provide a picture of the bead cutter at work (Figures 50-52, 62-64). The use of machines for cutting glass beads is documented in the second half of the 19th century. I found the oldest privilege of this kind among those held by Hatscher of Haida from 1868 (Figure 65). The production of the little cut-glass beads was a process worked out by Strauss in Gablonz; it consisted basically in pressing the glass tubes against the steel disc of a quickly rotating cutting-cylinder (Figure 66). Processes for cutting glass beads in drums go back to Rössler of Wiesenthal (Figure 67) and Bayer of Gablonz (Figures 68-69). In addition to a drawing, there are also samples belonging to the privilege awarded to Strauss of Gablonz (Figure 70). The bead-cutting apparatus of Schöler of Wiesenthal was acquired by Weiskopf of Morchenstern by cession (Figure 71). The privilege held by Schmidt of Friedstein was concerned with "the round cutting of glass corals" (Figures 72-73). Bead-cutting machines were also registered for patenting by Daniel Swarowski, Franz Weiss & Armand Kosmann in Johannesthal (Figure 74) and by Hellmich in Wolfersdorf (Figure 75).

Polishing

The shiny surface of a bead could be achieved in a number of ways. The most desired (most beautiful and most expensive) was the so-called "tin polishing" which, as the name indicates, used a tin disc. Other processes were water polishing and fire polishing. The special characteristics of some beads meant that only certain polishing processes could be used for them. For example, water polishing is the

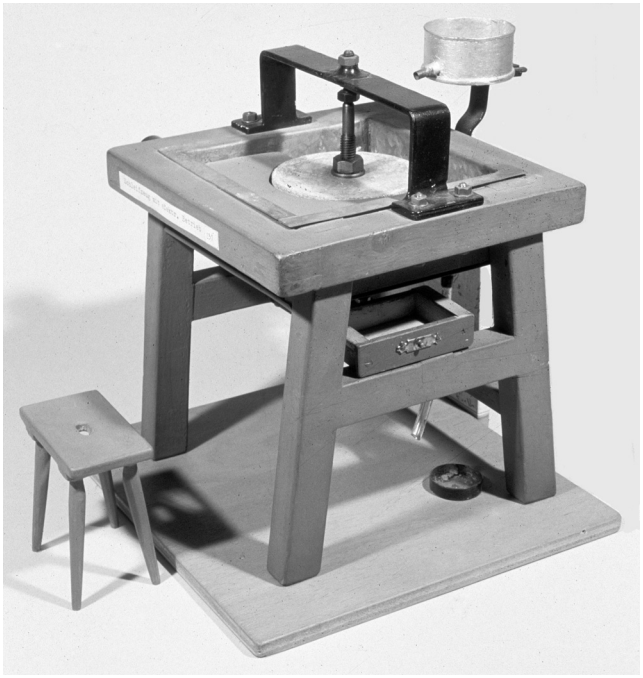

Figure 62. Model of a manual grinding apparatus with a tin polishing disc (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

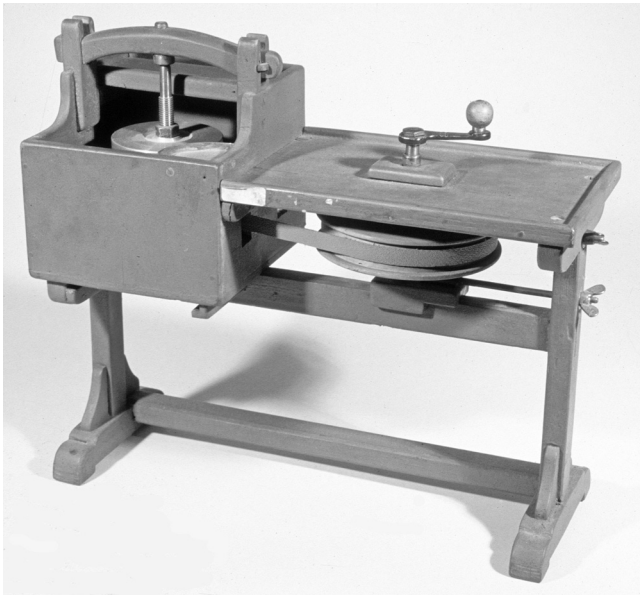

Figure 63. Model of an electrically driven grinding apparatus (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

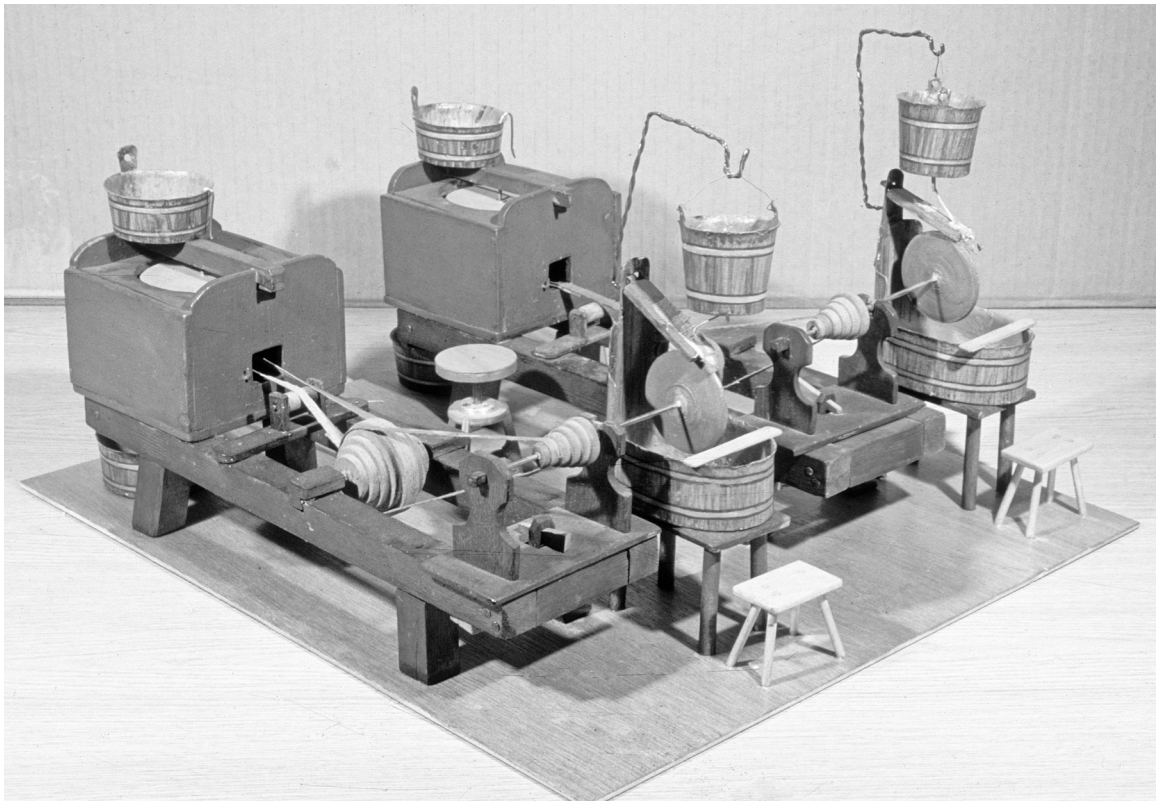

Figure 64. Model of a wheel bench for grinding smooth surfaces (English work)(Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

only process that can be considered for the Atlas bead. The old method of giving beads a round shape in a pan or drum also made them shiny because of the heat; it was a kind of fire polishing. The term *schmelz* (melted) is taken by some authors as going back to the process of polishing by heat in fire (Lilie 1895:166); improvements led to "double melted" (twice-polished beads) and to the "new double melted" which was made in especially good quality from sharp-edged glass produced by Riedel (Posselt 1907:10).

The term "polished" (*geschmirgelte*) bead is confusing because it is not the bead itself that is polished: the inside surface of the mold was so highly polished with an abrasive that the surface of the bead was already shiny after mold-pressing and did not need any additional polishing.

According to Posselt, larger beads were polished at a wooden wheel first; fire polishing in a polishing furnace followed later. Fire polishing is supposed to have been invented by accident more than 100 years ago by a man from Neudorf: "He dried the beads in the oven with a very hot fire and left them in rather long (he probably forgot to take them out in time). The beads had begun to melt and because of that, they took on a "marvelous shine" (Posselt 1907:8, 9).

The so-called "machine-beads" were made by throwing raw broken beads into a box with a grindstone; the sharp edges were rounded off through rotation, then polished. One contemporary source gives detailed information on the processes used for polishing towards the end of the 19th century (*Sprechsaal* 1896:1026).

MOLDED BEADS

Beads with a wide variety of appearances were pressed into shape (e.g., Figure 76; Plate 16C). These processes, referred to as "squeezing," "molding," or "pressing," also involved an extremely wide variety of tools and machines. "Molding "and "squeezing" were expressions that were apparently used for simpler tongs and shop work; "pressing" was more likely to have been reserved for processes involving machinery. There is mention in 1856 of "molding works" and "squeezing workshops" (Reichenberg 1856:166), of "pressing or squeezing work," also still found in 1880 (Karmarsch-Heeren 1880, 4:52), and Parkert (1925:184, 185) writes of the "molded or pressed bead." According to Parkert (1925:132, 133), the glassworker Domenico Miotti and the glassmaker Christophore Briani are to be credited