BEADS FROM GABLONZ[1]

Waltraud Neuwirth

Translated by Ann Dubsky

During the 19th and 20th centuries, Gablonz in northern Bohemia (now Jablonec nad Nisou in the Czech Republic) was a major producer and supplier of glass and ceramic beads to the world market. This production center created beads of myriad forms, using all the major manufacturing methods. This detailed study provides a thorough overview of the various methods including patent details as well as information concerning bead names, shapes, coloring, decoration, sizing, stringing, and historic prices. The text is accompanied by numerous illustrations of the beads under discussion and the tools and apparatuses used to make, size, and string them. There is also a well-illustrated section on the pre-1913 sample cards of two major Gablonz companies, the Redlhammer Brothers and the Mahla Brothers.

INTRODUCTION

Beads from Gablonz (Figure 1) sparkle at us from their sample cards in brilliant colors, silvered and gilded, shimmering in silky pastel hues. Jet black, they stand out from silk and tulle, lend radiant brightness to bead mosaics and decorate fabrics in dizzying variety. Embroidered and knit, they become neighbors to metallic beads; artistically braided into bell pulls, they serve both the eye and the ear; their sparkle crowns diadems and combs, clasps, and pins. From the matte-black of mourning to the splendor of jewelry for the theater, the entire range of emotions from pain to joy can be found in the sheen of carefully chosen beads. Nut-sized or as fine as a speck of dust, they align in rows for heavy necklaces or stream like unpolished spangles across surfaces, creating ornaments that appear to be painted with tiny specks of color.

Blown, molded, and wound from glass, pressed from plastic matter, the beads from Gablonz take on all imaginable shapes: spheres and olives, cubes and cylinders, rings and discs, spindles and spools, fruits and flowers. They bear fantasy names such as Atlas beads, morning-ray beads, feather and snake beads, boxers and toggles. Already at a very early time, they were spread over all the continents of the world. Many were lost, broken, or stored away and forgotten. Taking complicated paths, some of them have managed to find their way back to Europe, back to Bohemia where they came from. How do we recognize them, these beads from Gablonz? What do we call their many different types? Who still knows about the flames and molds, the furnaces and tongs that brought them into existence?

Millions of beads made of glass and ceramic can no longer be properly interpreted. No one knows the time or place of their manufacture. In our search for clues, we would probably have found ourselves in a no-man's land if it had not been for the indispensable witnesses of the time: the sample cards and books, the licensing privileges and glass recipes, and the reports of travelers who stood gaping in the huts of the glassblowers and pressers, to whom the maker of composition glass closed his doors, who watched the long pulling processes used in glass factories for drawing tubes and were blinded by the glorious colors of the canes.

Like no other city, Vienna is favorably inclined to researchers: museums, archives, and libraries reveal treasures that leave one asking how it will be possible to master such richness (the Gablonz beads in a globally unparalleled collection reaching from Biedermeier to Art Nouveau, owned by the Technical Museum in Vienna, are a completely unexpected discovery). Only a fragment of the wealth of material uncovered can be forced between the two covers of a book. Therefore, despite its considerable size, this publication can show certain phenomena in highlight form only: the beads and sample cards from the turn of the 20th century and bead technology. It is hoped that a vivid impression will be provided by the illustrations which try to combine public property and the private passion for collecting. The explanatory text that accompanies them had to be kept within spartanic limits because of the volume of the sources available.

Using information taken from the collections in Vienna and in Kaufbeuren-Neugablonz (Gablonz Archive and Museum, Neugablonz Industry and Jewelry Museum, Kaufbeuren-Neugablonz), combined with privilegia in the Austrian patent office in Vienna and illustrative material from companies still active today, special attention is first directed to the production methods used for glass beads.

Figure 1. Map of the Gablonz region, 1895 (Lilie 1895).

Extensive chapters are devoted to drawn and mold-pressed beads and to wound and blown beads. Colors, shapes, and sizes and the problems of terminology are treated in special sections of their own. The sample cards from two Gablonz companies, the Redlhammer Brothers and the Mahla Brothers, are another important area. The contemporary documentation includes texts on the technology and history of Gablonz beads and is enriched with illustrations from the second half of the 19th century.

The technological introduction intentionally exceeds the temporal boundaries (Historicism and Art Nouveau) set for this publication so that certain procedures can be described better. Here, the collection in the Technical Museum in Vienna is indispensable; its richness is a continuous source of astonishment. Particular treasures among this diversity that is yet to be fully explored are the beads from the Biedermeier (from the "Imperial Chamber of Factory Products") and Art Nouveau periods. Raw materials and semi-finished products, from chunks of composition-glass from Bohemia to cakes of enamel from Venice, from tiny thin-walled tubes for producing blown beads to the bugles and canes (smooth and twisted, in filigree and network patterns) come to us along with sample cards and sample books.

Extremely delicate Viennese blown glass and wax beads, Venetian glass bead sample books with hundreds of embroidery beads, bunches of Bohemian Biedermeier beads, Riedel's "ballotini" from the turn of the 20th century, and the necklaces of blown-glass beads are impressive in their many colors and techniques, with and without "belts" (smooth or in a broken line), melon-shaped mold-blown, or hollow wrapped.

Solid glass beads with stepped or rhomboid cuts belong to the high art of the glass cutter. Sophisticated coloring techniques (color in the batch; overlays; colored, silver, and gold linings) make subtle shading possible. There are many variations in the beads with metallic finishes, the copper-colored beads, the internally ribbed golden beads, the iridized and lustered beads. We have the "lamp blowers" or "glass spinners" to thank for the wound beads with decorative trailing from fine glass canes melted onto them. In the "Factory Products Cabinet," special attention was always

given to technology, to a representation of the individual stages of the work involved, so that even today the creation of a bead can be followed in several stages: from the cane to the drawn bead, from the cut to the polished Bohemian bead. Semi-finished items, "squeezed" in molds, and metal mountings for the glass portions of rings, pendants, and earrings are also preserved.

BEADS FROM GABLONZ

Scatter and embroidery beads, rassades and rocailles, macca and charlotte beads, drawn and blown beads, wound and mold-pressed beads, silver and fine gold beads, wax beads, baroque and craw beads, pound and string beads, spindles and spools, bugles, glass corals, and glass garnets – the names are as numerous as the beads themselves and their meanings and interpretations vary in turn. From the Biedermeier period alone, there are inexhaustible varieties of Bohemian beads known to us; whether free-formed or "squeezed" (*gequetscht*), solid or hollow, they show an astonishing variety and range of modern and contrasting color: round and faceted, wrapped and striped beads, some with "belts" and aventurine bands, grooved and patterned, color lined, satin and silvered beads, in pale pastel shades, with silky surfaces and in bright Art-Deco color combinations (Plates 1A-1C, 21D-24B).

The great variety of Gablonz beads is revealed to us in the most important sources of the 19th and 20th centuries: the writings and statistics on the economy and the geography of Bohemia, the reports and commentaries on exhibitions, address books, etc.

One report from this time that is representative of many others, sheds light on the situation of Bohemian glass bead production: a Kreutzberg report from the year 1836 dealing with "glass compositions, beads, squeezed, and blown glass." It states that some 10,000 people were involved in this branch of production which showed a profit of 2,000,000 florins:

> The main seat of the glass coral, rocaille and chandelier stone trade is the market town, Gablonz.... The production is mostly headed by local entrepreneurs who supply the workers scattered throughout the neighboring dominions of Morchenstern and Kleinskall with samples and materials. The former are divided into: composition burners (*Compositionsbrenner*), who melt the supplied glass batches in the most varied colors and shades, and then shape them into canes and tubes; glass and composition press-molders (squeezers) who shape the soft mass into raw chandelier and jewelry stones with molding tongs; these are then further refined by cutting, which takes place in their own grinding mills, a single one of which often contains 6-15 work places, which the grinding mill owner turns over to individual workers to use in return for a fee; bead blowers, cutters, gilders and stringers, of which the latter (nearly 300 in the Dominion of Morchenstern alone are mostly children) string the finished beads onto wire and thread (Kreutzberg 1836:25, 26).

Gablonz Glass Smallwares

The beads from Gablonz (chiefly drawn, mold-pressed, and blown beads) were only a part – albeit a very important one – of the later so-called "Gablonz industry," whose products are also known under the term "glass smallwares" or "quincaillerie;" the school founded in Gablonz in 1880 also used the terms "quincaillerie and bijouterie" in its name. At the beginning of the 19th century, "glass smallware" was frequently synonymous with "the small art of glass making" (Loysel 1818:264), "small glassmaking" or "small glass products" (Leng 1835:500) which is more direct and vivid than the expression, "glass smallwares," in describing the size of the products. There are two main sources named here that are representative of many others during the periods of Historicism and Art Nouveau, which describe this production known far beyond the region's borders.

In 1854, several Bohemian companies took part in the "General German Industrial Exhibition" in Munich. J. and C. Pfeiffer and H. Fischer from Gablonz, along with A. Pazelt from Turnau, showed "quincaillerie products" (including "ear drops" and beads in a variety of techniques: "partly hollow, partly solid, mold-pressed, painted, striped in all colors [such as pink, opal, ruby, black, garnet, coral red, Atlas, gold, silver], cut and uncut, round, elongated, tubular." The Pfeiffer Company was awarded the "Large Commemorative Medal" "for the great beauty and inexpensiveness of their glass and quincaillerie wares and the unusually large size of the factory." Fischer received the "Medal of Honor" "for the beauty and low price of his beads, stones and buttons made from glass" (Munich 1855:47).

Around 1880-1881, the following products from the District of Reichenberg were listed as glass smallwares:

> 1. Glass buttons, glass beads, glass jewelry, glass boxes, glass toys, glass pipe tips (imitation amber), spun glass, glass wool, etc.
>
> 2. Jewelry sets, brooches, earrings, finger rings, medallions, diadems, combs, hairpins, bracelets,

crosses, scarf pins, necklaces, necklace clasps, cuff links, etc. (made of glass and in combination with bronze).

3. Glass paperweights for photographs, glass pyramids with thermometers, geometric objects finely cut of crystal glass for school use.

4. Chandelier hangings such as prisms, pendants, points, drip cups, chains, etc., candle drip collars, knife rests, flasks, ink wells, glass door handles, etc.

5. Imitation precious stones in all colors.

6. Black, finely cut, glass fantasy-stones, discs, buckles, etc., for bijouterie fabrication.

7. Bead embroidery, as for hanging lamps, wall baskets, bell pulls, flower baskets, etc. (Stehlik 1880-1881:198).

A statistical overview of "the actual glass quincaillerie-fabrication" in the Gablonz and Tannwald districts is provided by Gerner:

> Altogether, a total of 9 glasshouses existed in 1870 for rods, prisms, and small rods. These works had command of 13 glass furnaces with 79 larger and smaller pots, and also 12 stamping works. The number of workers employed was 336. There was only one additional glasshouse in Lower Austria that produced glass rods, amounting to 8 ctr. [1 centner = 50 kilograms].
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> There were 58 glass composition works. They employed 264 workers. The production, as raw glass rods, prisms, mold-pressed and composition glass, amounted to 60,438 ctr., worth fl. 907,000. Glass mold-pressing houses, that is, works where the drawn raw glass rods are mold-pressed while in a soft state, to be sent on to cutters, gilders, etc., were 160 in number and employed 1,032 workers.
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> Cutting works, which used water power for the most part, were 268 in number. The number of treddle apparatuses (cutting benches that are set into motion by the worker's foot) approached 1,800. In these cutting works, some 2,859 men, 975 women, and 140 children, a total of 3,974 workers, were employed.
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> There were 76 spinning works in action, employing altogether 1,021 workers, in which the solid or hollow raw glass was worked at the lamp with the help of a blowpipe. There were 87 bead-blowing works, with 610 workers, in which hollow beads were blown in the same manner, then cut, painted, plated with genuine and imitation gold and silver. Besides, there were another 172 "Gürtler" workshops with 1,234 workers which were put to use by the glass quincaillerie industry ["Gürtler" = literally, a belt-maker, here however one who works with non-precious metals, especially in the bijouterie industry in the Gablonz area]. The value of the entire glass quincaillerie production amounted to at least 2 million florins.
>
> An additional 31 businesses in Lower Austria should also be listed here which made glass and wax beads to a value of 87,000 florins with 42 workers.
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> Also worth mentioning is the production of various types of glass beadwork which is done in Přibram in Bohemia by an establishment which employs eleven, mostly female, workers, and out of about 30 ctr. of Parisian galvanized iron wire and 70 ctr. glass beads, formerly their own products, now of Venetian provenance, and 3 ctr. of sheet zinc, fabricates about 5,000 grave wreaths, flowers, etc., mostly for sale to France... (Gerner 1880:227-279).

Around the turn of the 20th century the term, "Gablonz Industry," which established itself at a very early stage, soon became a...

> collective name for a whole range of industries.... It is possible to divide the Gablonz Industry into separate groups according to the materials that were used: metal, black or crystal glass, or the production processes: "Gürtler" and glass mold-pressing works which produced articles themselves, since the materials they used and the production procedures were extremely closely related" (Tayenthal 1900: 12, 13).

Despite being subjected to certain changes, the definition of the term, Gablonz industry, remained constant in one aspect: in the rich variety of the "production assortment" that was inseparably associated with the name Gablonz. This name reached beyond regional borders and became a generic term, especially in the Austrian and German centers of the Gablonz industry, which were given the name "Neugablonz" (New Gablonz) when they were founded after World War II.

The Names of Beads

Apparently a number of the names for "natural" beads have been applied to "artificial" beads, or at least were used for these simultaneously. For that reason the following makes a short reference to natural beads.

Real Pearls

Size and shape gave real pearls different names: "piece, count, or *Nett* pearls" were round and for that reason the rarest; they were traded by the piece or by count and their value was determined by jeweler's weight, according to grain and carat (Altmütter 1841:69). *Inter-nett* pearls differed from *nett-pearls* in their "less perfectly round shape" (Altmütter 1841:69). "Seed or *Loth* pearls," about the size of millet seeds, were used for embroidery. Pearls with irregular shapes were called "craw, baroque, or lump pearls" (*Kropf-*, *Barok-* or *Brocken-Perlen*). Like seed pearls, they were mostly sold by weight (ounce or *Loth*, a German unit of weight equaling about half an ounce). "Parangon [paragon] pearls" were exceptionally large; *Monstres* were big pearls with unusual shapes. "Loaf-heel or kettledrum pearls" were flat-round; "cylinders or barrels" approached cylindrical form. *Coques* was the name given to irregular pearl-like formations that were mounted in gold and used for jewelry (Altmütter 1841:69, 70).

"Count pearls" were also described by Pierer in 1851 as "especially big, regular, and round pearls." He called the olives and cylinders "card pearls" (sic!); the irregular, angular, large pearls he called "chunk or lump pearls [*Brocken-Perlen*]," and the smaller ones he referred to as "seed pearls" or "pearl dust." Pierer (1851, 8:797) calls the finest artificial pearls *margrites* ("dust pearls"), which were used for embroidery, hanging knots, and tassels.

Kulmer lists the usual terms; the "piece, count, or *Nett* pearls, the *Inter-nett* pearls, seed or *Loth* pearls; craw (*Kropf*), baroque, or lump (*Brocken*) pearls; paragon (*Parangon*) pearls, *Monstres*, cylinders or barrels." In addition there are the drops or pear-shaped drop pearls. What Altmütter calls "*Coques*" are "*Loques*" for Kulmer (1872:321, 322).

Bucher goes by shape to distinguish "baroque pearls" as pearls showing "irregular formation," and by size for "paragon, count, *Loth*, seed pearls, dust pearls" (Bucher 1883:296).

Some of these terms were also used for glass beads. For example, the names seed beads, baroque beads (a term used in some places for all glass beads with irregular shapes) including craw beads (*Kropfperlen*) (Parkert 1925:160), cylinders, dust beads, and others.

False Pearls

In addition to the pair of opposites, "real pearls/false pearls," there was also one of "natural and artificial pearls." When the real pearls are placed opposite false (faux, fake, artificial) pearls in the wider sense, the contrast applies to all beads of widely differing materials (glass, ceramics, amber, horn, etc.); in the narrow sense they refer to the so-called pearls that attempt to imitate genuine pearls. In the original German-language usage, the meaning is not so clear, however, since the word for "pearl" and "bead" is the same (*Perle*). Among the glass bead imitations of pearls, we find glass beads to which fish-scale essence is applied, either inside or outside. These can either be hollow or solid glass beads.

> False pearls are larger or smaller, very thin-walled glass balls, which have a little opening on two sides opposite each other and are filled with certain materials or at least coated on the inside to give them the appearance of genuine pearls. Their shape is sometimes spherical, sometimes oval like olives, sometimes pear-shaped, sometimes almond-shaped, and sometimes even circular and flat (Loysel 1818:306).
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> Of all the artificial beads, those with the greatest importance are the glass beads (also wax beads). Marcasite beads are glass beads filled with the easily fusible, reflecting marcasite metal, which is also used for making sulfuric acid and ferrous sulphate. Pearls are also made of mother-of-pearl and similar nacreous shells, of steel (steel beads), gold or silver plated tombac (gold and silver beads), of alabaster coated with wax and pearl essences (Roman beads), whereby the coating soon wears off with wearing, of wood, resinous and other substances perfumed with rose oil (oriental rose-pearls) (Bucher 1883:296).

While the *Enciclopedia* of Anfosso (1889, 6:698 ff.) includes the term "artificial pearl" in a number of languages (Italian: *perle artificiali*; French: *perles artificielles*; English: "artificial pearls;" German: *künstliche Perle*; Spanish: *perlas artificiales*), the term "*false pearl*" is also used in English (Sauzay 1870:198) and in the French *perle fausse* (Sauzay 1868:244). Karmarsch and Heeren (1883:607, 608) differentiate between "genuine pearls (*perles fines*)" and "artificial, false pearls" (blown beads with pearl essence – *essence d'orient* – made from fish scales); glass pearls are treated under a term of their own ("*grain de verre, rassade, perle artificielle* – glass pearl").

About the Names for Glass Beads

When, in 1874, the almost infinite variety of lampworked beads is referred to, then this also applies to glass beads in general (Zanetti 1874:135, 136). This variety has so far successfully withstood any attempt to force all its types into one single system; the only classification system that will ever be possible is one of certain representative types

of beads, since every system has to standardize and thus simplify.

Nevertheless, in the course of time, a certain nomenclature for glass beads has built up, although it often seems better suited for creating confusion than clarity: the differing usage of many terms, the changes in their meaning over time and – last but not least – a continuing lack of basic research, contribute to this confusion. Beyond that, certain aspects defy exact labeling, because of the difficulties of naming the material (*Masseperle* ["mass-bead]" – is it glass or ceramic?) or the technique ("faceted bead" – is it a bead faceted by cutting or one with a mold-pressed, faceted shape, ground, or fire polished?).

For North American researchers, the most important aspect for dividing beads into categories is the production technique: "drawn, wound, wound on drawn, mold pressed, blown, and Prosser molded." Other important characteristics for differentiating are: "structure (simple, compound, complex, composite), shape, decoration, color, diaphaneity, luster, and size." After providing a survey of the various systems (Beck 1928; Kidd 1970; Ross 1976; Stone 1974), Karklins (1985:87 ff.), however, doubts that it is possible to include all the variations: "...the practicability of recording varieties in a comprehensive classification system becomes doubtful when one considers that well over 100,000 varieties of glass beads have been produced in the world to date."

We find no consistency in terminology; it appears that certain beads were named at will for their most striking characteristic, such as the technique ("wound bead"), shape ("cube"), color ("gold bead"), function ("link bead"), surface treatment ("iris bead"), etc. The way one differentiates between "genuine" and "false" and "natural" and "artificial" beads also appears to be arbitrary. As far as material is concerned, the "mass" bead assumes a rather vague position compared with the glass or porcelain bead. The starting material for the glass bead is usually divided into glass and "composition" (*Kompositz*, *Comprsitz*), even though the latter is also glass. Therefore let us not be unduly disturbed by the terms "glass composition" or "composition glass!" And will we ever find out whether we may really equate the Italian *smalti* and *vetri*, the French *émail* and *verre*, and the English "paste" and "glass" with the German *Composition* and *Glas*?

Can we only classify the rods, tubes, and canes according to their size? How does our path take us from *Kulanz* to *Coulance* and to "Atlas" bead, which consists of that type of glass made with trapped, linear air bubbles, but is not the same as the Atlas glass of the hollow-glass industry? In regard to the transparency of the material, there are again a number of categories that, among other things, also depend on the state of preservation of the bead in question: transparent, translucent, opaque. In between there are many gradations which are determined by all sorts of factors, such as the thickness of the glass, to name only one.

In addition to the basic shape of the bead, according to its longitudinal profile (round, oval, rectangular, triangular, polygonal, curved concave or convex, etc.), there is the far greater number of façon beads that cannot be subjected to any kind of classification. Longish tube segments are also defined in very different ways: sometimes glass items with a long convex shape are called *Spindeln* ("spindles") (chart, F. Unger, Liebenau, Technical Museum Vienna, TH 34341), at other times "cylinder beads" or "tubes" (Breit n.d.). Under the label "cubes" (*Würfel*) we sometimes find beads that are broken from four-sided glass tubes, as well as blown or solid (*volle Würfel*) cubes (i.e., cubes molded in mold-pressing houses)(Posselt 1907:1). An excellent view of the almost limitless variety of bead shapes is provided by a selection of strung beads that were used as raw materials for further processing (Figures 2-13).

On the sample cards from Emil Hübner & Son in Neugablonz, the shapes are labeled as follows: spheres (*Kugel*) and cones (*Kegel*), spools, round beads, triangles, pyramids and double pyramids, square crosses (*Kreuzquader*), cones, rosettes, hubs (*Nabe*), paving stones (*Pflasterstein*), tops (*Kreisel*), honey-combs (*Wabe*), drops, olives (beveled, hexagonal, screw, bayonet, baroque, drill [*Bohreroliven*], Florentine olives), pears (screw, flat, beveled, and transverse pears), cylinders (round cylinders, bone cylinders [Knochenwalzel], grooved cylinders, S-cylinders [*S-walzel*]), clover-leaf, rose-beads, leaf, lentils, grapes, melons, berries, apples and pears (long pears, baroque pears), single-, big-, giant- and wide-hole beads, buttons (oval and faceted), pipes, bows (*Masche*), thimbles, arrowheads, bones, molars, blister beads (*Beulenperle*), wings, bells, and cogwheels. This list is by no means complete, but it does show the possibilities for giving names to shapes. With a few exceptions reserved for generally accepted terminology, the choices made by individual companies were certainly different.

Extrapolating the shape of a bead from its name can sometimes be compared with the difficulty in determining the technique of manufacture based on an examination of the surface of a bead: was the faceted surface cut or mold-pressed and then cut, or was it mold-pressed with an already polished surface through the use of polished molds? Neither is it always easy to differentiate beads with interior ribs from those with exterior ribs.

In the naming of colors, an added problem is the question of what technique was used to achieve them? Were

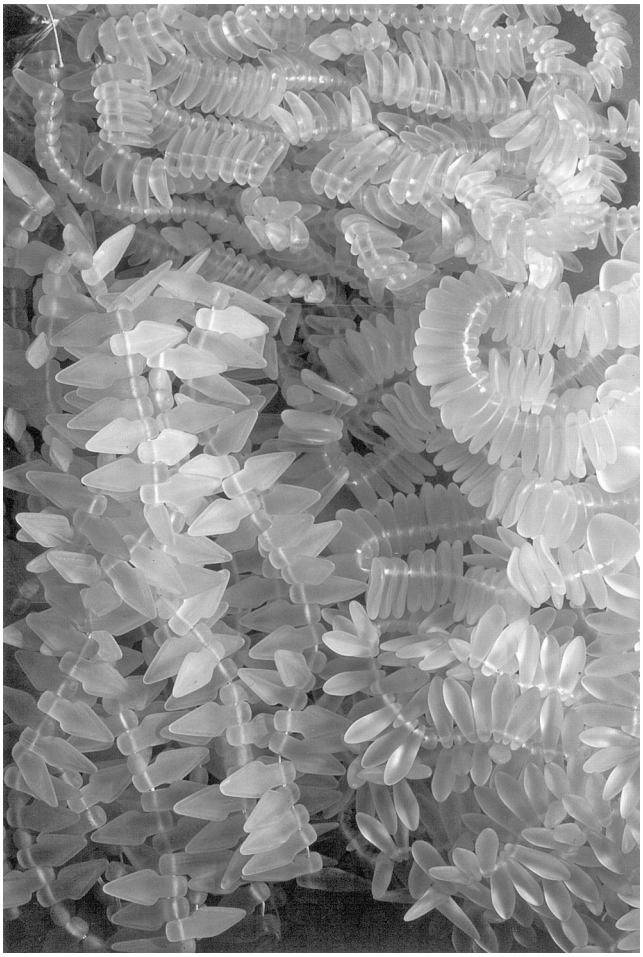


Figure 2. Façon beads; Heinz Fitschek & Co., Steyr-Gleink, Austria, after 1950.

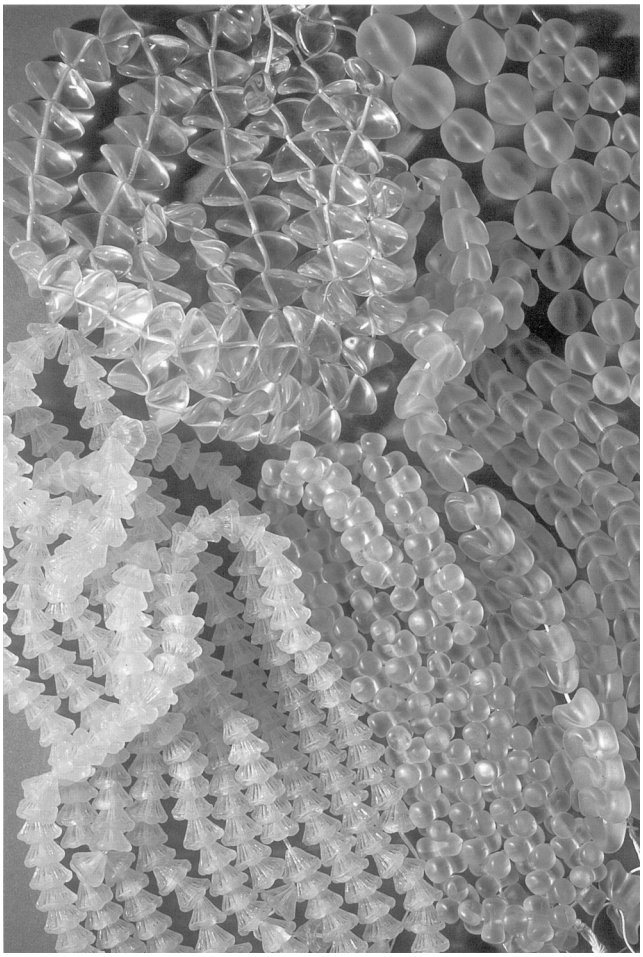


Figure 3. Façon beads; Heinz Fitschek & Co., Steyr-Gleink, Austria, after 1950.

they colored in the batch, with overlays, colored linings, superficial etchings, or was the color painted on?

For a long time the opposites, "hollow/solid," were the underlying criteria for classifying beads. We find this in many contemporary sources of the 19th century (encyclopedias and specialized literature on glass technology). Keess (1823:899) draws the difference between "2 main categories... solid or melted, and... hollow or blown." Leng (1835:500) is satisfied with a list of "small glass products:" glass beads, glass corals, glass garnets, glass buttons, luster glass, knitting and embroidery beads, and seed beads. Altmütter (1841:87), like Keess, lists hollow and solid beads.

J. Loth draws a difference between beads made from glass rods and those made from glass tubes. Bohemian glass beads are made from glass canes which were "squeezed by means of a mold, pierced and strung." The Venetian embroidery beads are made from thin glass tubes that are chopped up; they lose their sharp edges over the fire (Loth 1859:72). The beads that imitate real pearls are the glass beads with shiny, silvery pearl essence (made of fish scales); glass corals are coated inside with colored wax and the silvered (*spiegelnden*) beads are given an inner coating of an easily fusible metal mixture (Loth 1859:73).

Benda pays more attention to the processing; he divides Gablonz beads into blown, snapped (drawn), and mold-pressed beads (Benda 1877:283, 284). Lilie (1895:165) also speaks of three "production methods:" lamp beads, mold-pressed, and snapped beads.

Finally, in 1911, Gustav E. Pazaurek decides on a division into four categories: 1) wound beads, 2) mold-pressed beads, 3) drawn-and-chopped beads, and 4) hollow beads. In regards to utilization, he establishes a difference between: 1) stringing, 2) sewing and embroidering, 3) braiding and weaving, 4) knitting and crocheting, 5) puttying onto and into, and 6) mounting in metal (Pazaurek 1911:1, 2). With only minor differences, this basic division has proven to be

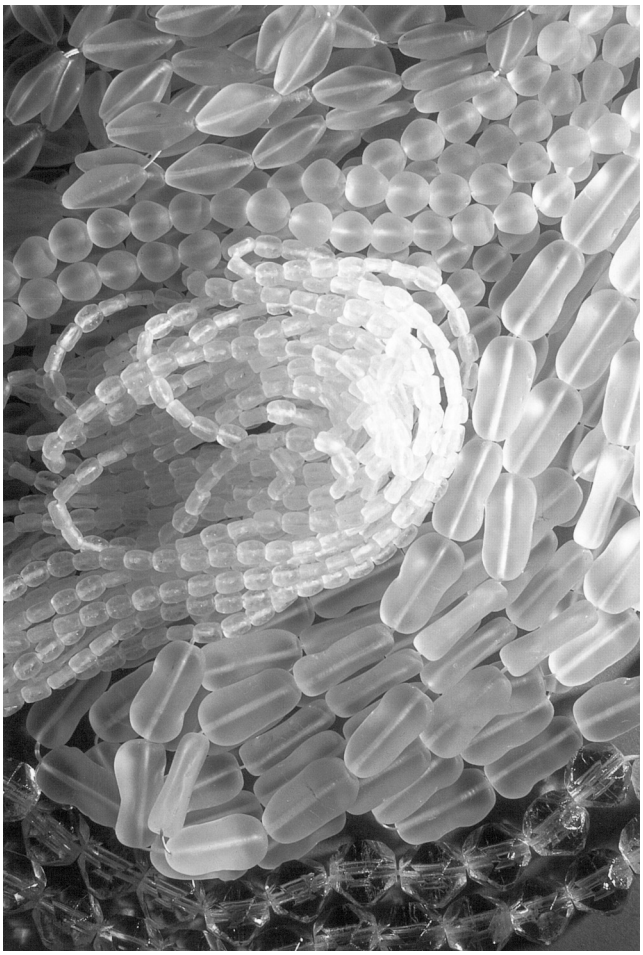


Figure 4. Façon beads; Heinz Fitschek & Co., Steyr-Gleink, Austria, after 1950.

Figure 5. Façon beads; Heinz Fitschek & Co., Steyr-Gleink, Austria, after 1950.

usable and has been accepted by most of the authors who came after him, with or without a source reference.

Parkert devotes a special chapter to the following bead categories: wound beads, chopped (*Hackeperle*) beads, snapped (*Sprengperle*) and seed beads, hollow glass beads, and mold-pressed beads (Parkert 1925:129, 206). His differentiation between snapped and chopped beads – which is technologically thoroughly justifiable – is noteworthy (Parkert 1925:139, 146). Pörner simply lists the categories of beads, although he does place the production methods at the beginning:

> One differentiates glass beads according to their types and shapes. There are innumerable terms for them: snapped, mold-pressed, hollow, silvered, wound, fine gold, genuine gold, silver beads, etc.; those referring to shapes are acorns, toggles (*Knebel*), bottles (*Buttel*), pears, bugles (*Stiftel*), olives etc., those referring to production are blown, mold-pressed (solid), wound, in regards to decoration there are cut, colored, lined, gold lined, silvered beads, etc." (Pörner n.d.:2).

There is an extremely scarce sample collection from the first half of the 19th century that documents the most important terms, types of cut, colors, and sizes of Biedermeier beads from the Gablonz area. The terms are probably valid in general for the whole region. The system presented in the chart of Ferdinand Unger from Liebenau (Technical Museum Vienna, TH 43431) is very brief but all the more vivid. It includes both the shape (round = beads, oval = olives) and the color (coral) or the surface appearance or production method (satin): coral beads, coral olives; satin beads, satin olives; garnet olives (faceted dark red olives). Company sample cards with later dates are much more abundant. The terms they use are not universally valid, if only for the reason that in addition to the terms usually used in the business, such as "rocaille," "oriental beads,"

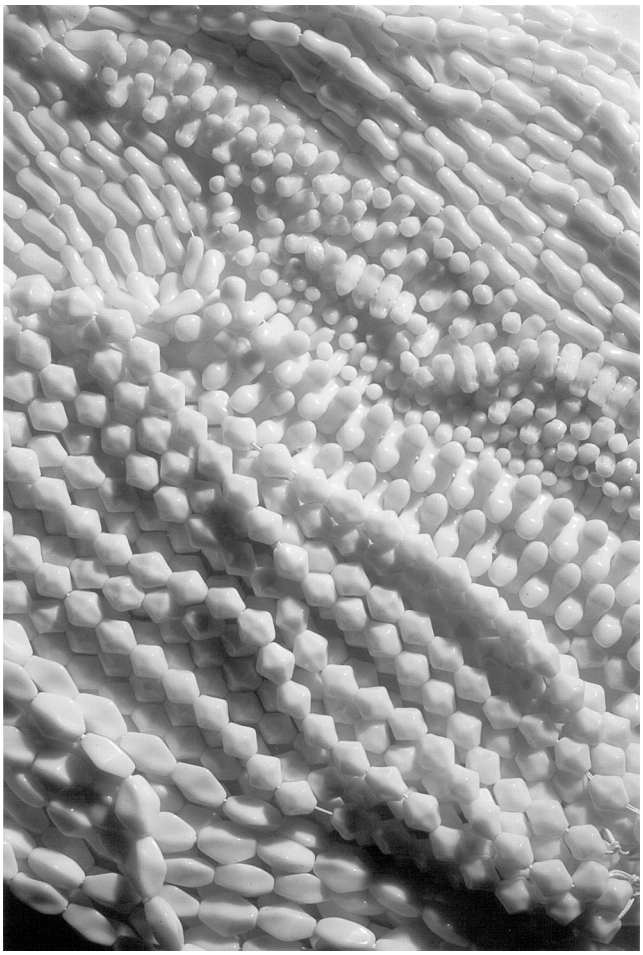


Figure 6. Façon beads; Heinz Fitschek & Co., Steyr-Gleink, Austria, after 1950.

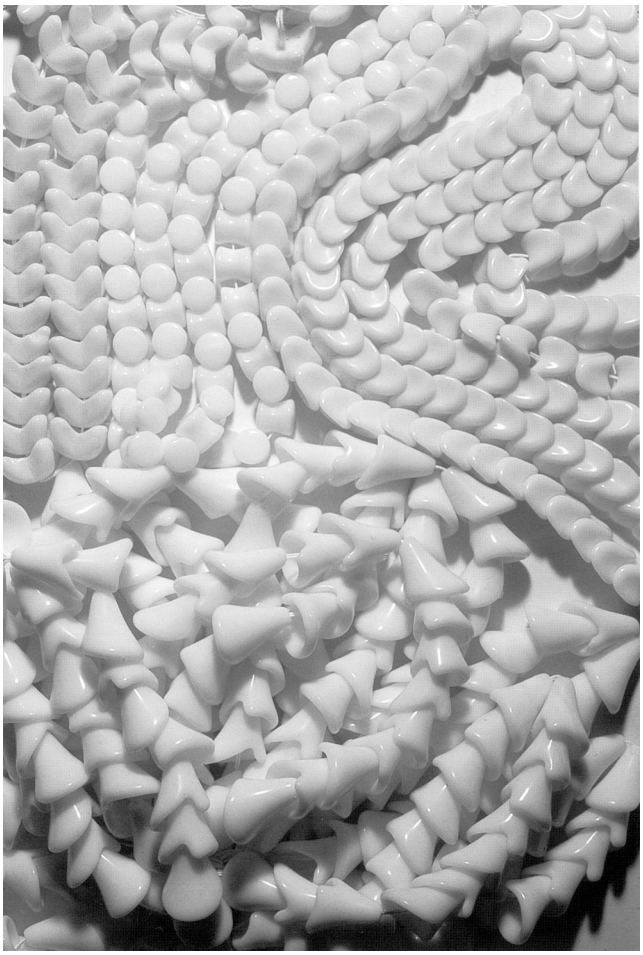


Figure 7. Façon beads; Heinz Fitschek & Co., Steyr-Gleink, Austria, after 1950.

etc., expressions used only by a specific company are also employed. Frequently a certain kind of bead is not listed by name but by an article number, and with few exceptions, colors around the turn of the 20th century are generally indicated by numbers. Systems for listing sizes also vary, depending on whether the sizes are based on the number system (starting point, the null bead ["0" bead]) or on the size in millimeters or in lines.

On the Redlhammer sample cards, to which this study devotes a special chapter, we often find article numbers as well as bead names in the export languages, English or French: Oriental Beads, Knebel-Beads, Rocailles, Scale-Beads, Ring-Beads, Shell-Beads, Snake-Beads, Link-Beads, Chain-Beads, Demie Olives, Feather Beads, *Perles à facettes*, Coraline-Beads, Molars, etc.

Sample cards from the company Glass Export (Section Beads, Jablonec), probably from the time after the Second World War, show "Rocailles and Seed Beads" and "Cut bugles" with many terms for the decoration.

The following names or types of beads are present on examples displayed at the Neugablonz Museum or are represented in the contemporary literature held there (Adressbuch 1924:27-38):

> Ballotini, Boxer, Coulanze Beads, Couppe Beads, Diabolos, Double Capsules, Mold-pressed and Façon Beads, Real Gold and Silver Beads, Real Baroque Pearls, Real Pearl Formations and Shells, Ice Beads (Crackles), English Beads, Fantasy Beads, Color-lined Beads, Fine Imitation Pearls, River Pearls, Hollow Block Beads, Toggle Beads, Lamp Beads, Shiny Beads (Wax), Macca (Snapped Drawn Beads), Machine-cut Beads, Mass (*Masse*) Beads, Melon Beads, Mosaic Beads, New Beads, Oil Beads, Mother-of-pearl Hollow Beads, Platinum-colored and Genuine Platinum Beads, Passementerie, Rhombic Beads, Ring

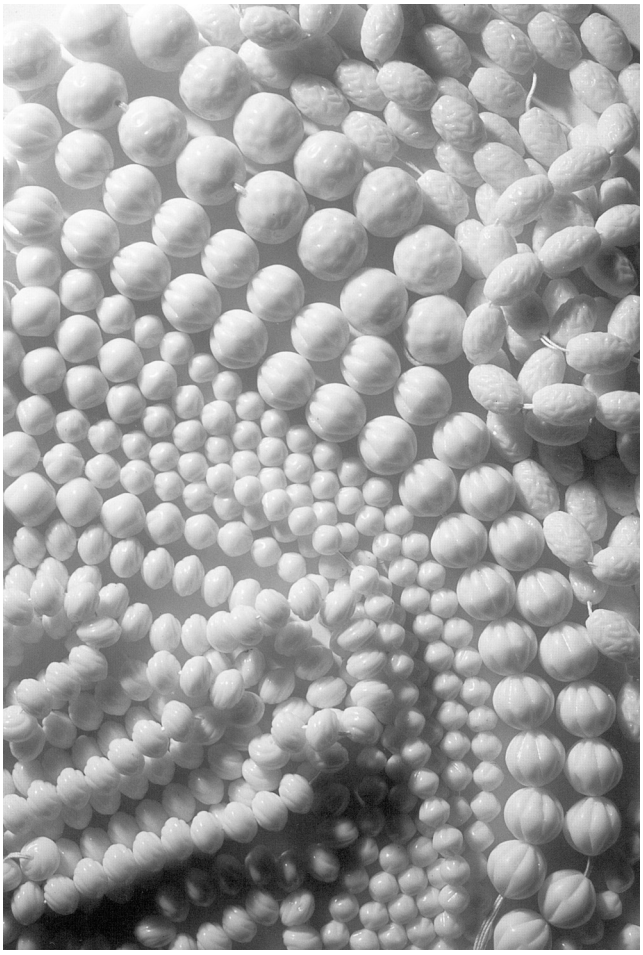


Figure 8. Façon beads; Heinz Fitschek & Co., Steyr-Gleink, Austria, after 1950.

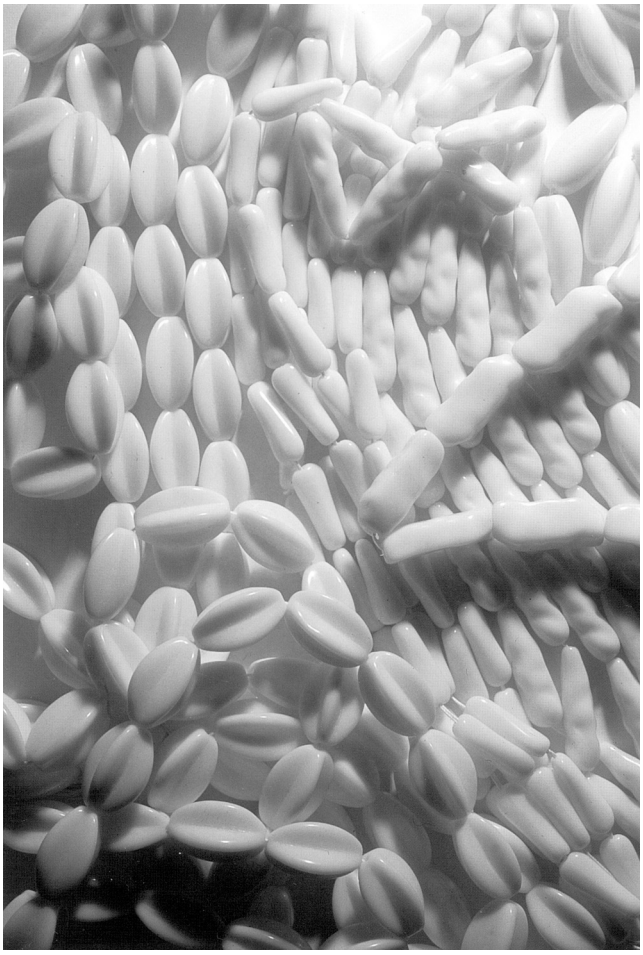


Figure 9. Façon beads; Heinz Fitschek & Co., Steyr-Gleink, Austria, after 1950.

> Beads (English), Rocailles, Rocaille Substitutes, Rumble Beads [*Rumpelperlen*], Round Beads, Cut Beads, Seed Beads, Pointed Olives, Pointed Ovals, Stick [Bugle] Beads [*Stiftperlen*], Scatter Beads [*Streuperlen*], Four-edged Cylinders, Four-edged Olives, Wax Beads, Molar Beads, etc. [not to mention beads made from other materials (wood, celluloid, Galalith)].

Verbal distortions like the "Couppe Bead" (presumably coupé) or "Crackles" (*craquelé*) sometimes disclose the origins of a bead, although occasionally the term remains a puzzle. We know that the so-called "real gold beads" are not made of gold, but of glass with a gold lining. It is likely that a similar situation applies to the "genuine platinum" beads and the "genuine baroque" pearls. In connection with glass beads, the meaning is clear; when the term is transferred to a different area (e.g., the metals sector), the door is wide open to misunderstandings.

A mention of 19th-century needlework magazines (*Allgemeine Muster-Zeitung* and *Bazar*) also seems to me to be important. Here a bead terminology is found that probably corresponded more to general usage than that of glass technology. "Bohemian" beads were understood to be the short, cylindrical pieces of glass tubing that were snapped off and also known, somewhat mistakenly, by the name *Hackebissel* ("chopped bits"). "Spindles" were long, cylindrical tubes that tapered slightly towards either end; "gold spindles (long, yellow, silver-lined beads)" were mentioned in *Bazar*, as were "white-metalized spindles, crystal spindles (long beads)." Among the "seed beads" (probably small rounded beads and bugles) were "black, long, short white, and bronze-colored seed beads."

"Pound beads (weighed beads)" and "big pound beads" were sold by weight; their quantities were often given in *Loths* (ca. half-ounce units). On the other hand, the amounts needed for a specific piece of work are given

Figure 10. Façon beads; Heinz Fitschek & Co., Steyr-Gleink, Austria, after 1950.

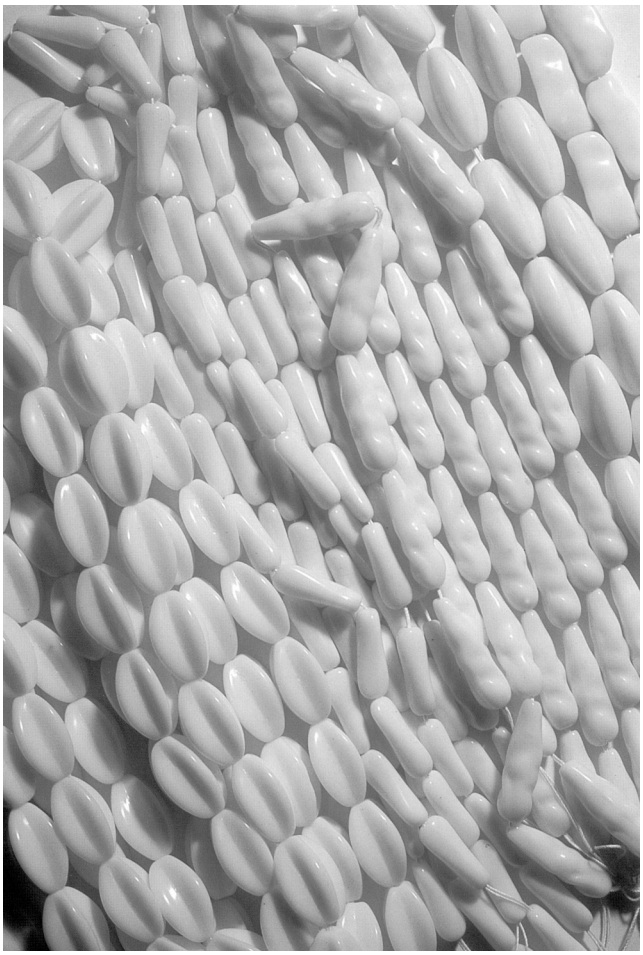


Figure 11. Façon beads; Heinz Fitschek & Co., Steyr-Gleink, Austria, after 1950.

in bunches or bundles, and the term *Maschperlen* (bundle bead), probably derives from this, just as the expression string beads (*Schnürperlen*) refers to the way they were sold commercially: "fine red string beads, bronze-colored string beads, small string beads in white," the so-called "morning-ray beads" (*Morgenstrahl-Perlen*).

The term "foam beads [*Schaumperlen*] (oval foam beads, golden foam beads, black foam beads, bronzed foam beads)" remains unclear. Presumably, they were not glass beads, but the thin-walled, very lightweight metal beads known from jewelry-making in the Biedermeier period. "Foam beads which look like steel" are mentioned in the *Allgemeine Muster-Zeitung*. In one place all the aforementioned foam or copper beads are listed under metal beads (*Allgemeine Muster-Zeitung* 1864:13)

Also unclear are the many terms using words from the realm of metals: "steel beads, gold beads, copper beads, quicksilver beads (elongated quicksilver beads, tapering funnel-shaped quicksilver beads)." In the language of hollow-glass blowers, the gold bead is a gold-lined glass bead. With this in mind, it might be possible to connect the so-called quicksilver bead with the marcasite bead, whose "mirror-coating" may have consisted of mercury, among other things. We can never be entirely certain that in certain connections, "metal bead" actually means one made of metal or one of glass made to look like metal.

The *Allgemeine Muster-Zeitung* provides instructions for making a candle drip collar: "Bohemian beads" in three colors are required for it, "namely 4 strings of silver lined, 2 strings of gold lined," which are later referred to as gold beads and silver beads (*Allgemeine Muster-Zeitung* 1864:13). Most likely, what was meant were silver- and gold-lined beads, although we most certainly may not carry this conclusion over to all other situations. We also find mention of metalized beads (silvered beads [*Spiegelperlen*]), metalized Bohemian beads, and bronze-colored glass beads.

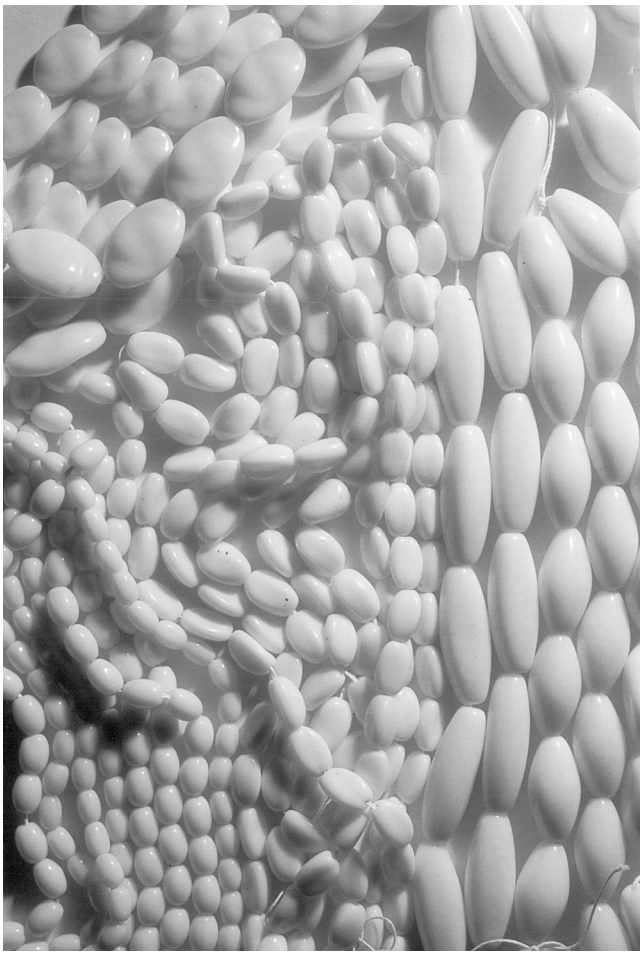


Figure 12. Façon beads; Heinz Fitschek & Co., Steyr-Gleink, Austria, after 1950.

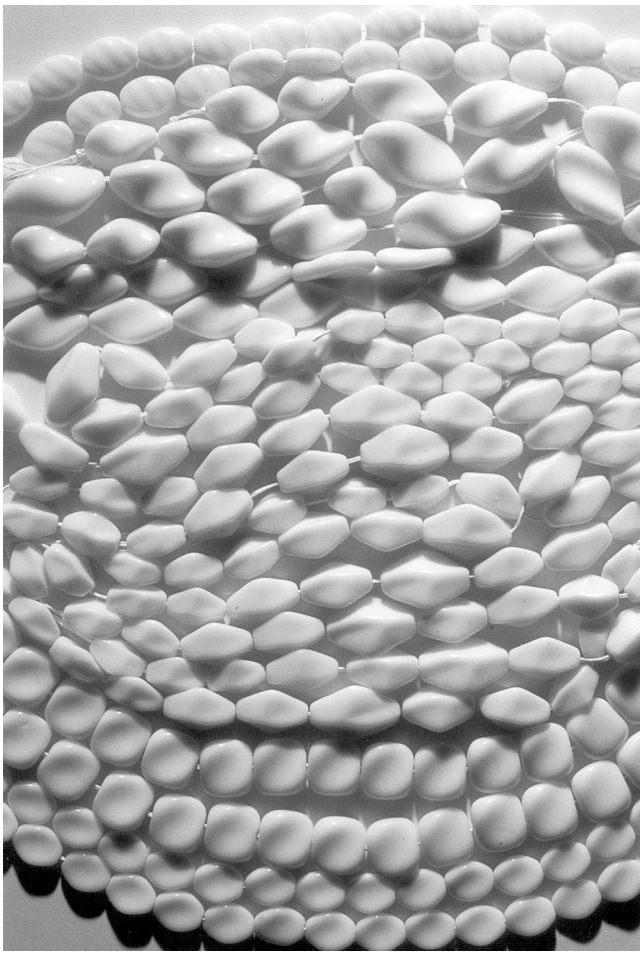


Figure 13. Façon beads; Heinz Fitschek & Co., Steyr-Gleink, Austria, after 1950.

Less frequently mentioned are "orange-yellow porcelain beads" (*Bazar* 1873), "white seed beads [*Emailleperlen*], blue iridized beads" (*Bazar* 1886), "faceted cut crystal discs (flat beads), pitted [*genarbte*] beads, trail-decorated (*übersponnene*) beads or façon beads;" very common, however, are "Atlas beads." Two types come under the heading "bead mosaic:" staggered or lined up in straight rows.

Glass Corals, Glass Garnets, Garnet Beads, and Paternoster Beads

Some names for glass beads confront us again and again, albeit in a confusion of different meanings. Glass corals and glass garnets belong to these terms. Generally speaking, one understood a glass coral to be a round bead and glass garnets to be faceted beads, though the terms were sometimes narrowed. On the other hand, it is quite possible to encounter a glass coral as a faceted bead (hollow or solid) or as a round bead or a paternoster bead intended for a rosary! And the coral bead does not always have to have a coral-red color as its most important characteristic; sometimes it is the shape or the finish (the cut), etc.

Let us look at several contemporary opinions from the 19th century in chronological order:

> Sometimes the little beads look as though they were cut with sharp edges, like garnets,... (Loysel 1818:305).
>
> In the red beads, which are supposed to imitate corals... varnish-like colors... are blown into them (Keess 1823:902).
>
> The glass garnets are made from a molten glass that looks as much as possible like real garnets and acquire their shape through cutting.... Glass corals

> can be had very easily. The worker sitting in front of the melting pot spears a gather of liquid glass onto a pointed piece of iron wire which simultaneously provides the coral with a hole and, through rapid turning, gives it its round shape, and then lets it fall into a cooling pot that stands at some distance from the fire (Leng 1835:503).

According to Altmütter, solid beads were "formerly often called glass corals" (Altmütter 1841:99):

> Occasionally one can observe that not only solid, but also hollow beads blown from thicker glass, cut and faceted, are made to imitate genuine cut corals when they are blown from crystal glass, and finally coated on the inside with red-colored wax (Altmütter 1841:106).

Loth (1859:73) states: "Glass corals are made of blown beads, which one coats on the inside with colored wax."

Karmarsch and Heeren (1880:44) add: "Glass corals are glass beads which are made from glass that gets the desired red color of corals through the addition of tin oxide, copper sulfide, and iron oxide."

Even language researchers, the etymologists, have a great deal to offer us: Pierer says that "corals" means the same as "little glass beads" (Pierer 1851, 11:853) and, in addition to attributing the paternoster with the names "Our Father" and "rosary bead," he also applies a third meaning: "necklaces of large and small beads or spheres or coins made into pendants or long tube beads" (Pierer 1851, 8:711).

The language dictionary compiled by the Grimm Brothers contains a flood of variations on the word "coral," stemming from various languages and periods, such as "*coralle, corallus, koral, korall, koralle,* coral;" then "*kralle, chroll, kralen, kraal, koraal, grall, krall, korelle, korel, corelln, krellen, karellen, krelle, korällelein, krallel*" (Grimm 1873, 5:1795).

In a later Grimm volume we find under the keyword paternoster: "1) our father; 2) the larger round bead (representing the Lord's prayer) in a rosary and also the latter itself; 3) a) in architecture, beaded molding, beaded frieze" (Grimm 1889, 7:1502, 1503). Consequently, "paternoster" confronts us as a bead in a rosary and the bead confronts us again in beaded molding. It only remains to add that the French *patenôtrier*, the German *Paterlmacher*, is sometimes used to mean the lamp blower and the bead winder.

COLORS AND COLORING, METALIZING, IRIDIZING, AND LUSTERING

The colors of "artificial" pearls are the result of the material used and the way it is handled, as well as the result of components which – like colored strings in colorless crystal beads (Plate 17B) – are not an integral element of the beads but influence their color all the same.

A complete color scheme would, of course, have to take into account all the possibilities of diaphaneity – from transparent to translucent to opaque in many stages – and also the technology of coloration, since this, too, brings about different effects: coloring in the batch, single and multiple overlays, colored linings, surface coloring, iridizing, lustering, and a great deal more. An objectively correct color nomenclature for beads is vastly more difficult to work out than norms for sizes. For that reason, many of the company sample cards list the colors mostly in numerical form (Plates 2B, 6B-C, 7B-C). The fact that every company had its own color scale with special number systems, goes without saying.

The "main colors" of the Biedermeier period are found on a chart compiled by Ferdinand Unger of Liebenau (Technical Museum Vienna, TH 34341). There are three categories:

> Series B (for glass beads with 3 facets): sapphire blue, dark blue, crystal, topaz, pale green, dark green, amethyst, brown, black, opal white, opal blue, alabaster .
>
> Series G (for fine composition beads): light ruby, dark ruby, light garnet, dark garnet, lemon yellow, chrysoprase, deep pink, opal, alabaster, opal blue, lapis lazuli.
>
> Series I (for extra fine glass beads): crystal, sapphire, dark blue, chrysolith, aquamarine, emerald, amber, topaz, amethyst, dark ditto, brown, black.

The range of colors for beads is almost infinite; the color scale for a single company was able to include hundreds of colors, so that getting all the shadings of a single basic color together would also have resulted in hundreds of different gradations of hues. Extensive, if not complete, is a color card from the Redlhammer Company on which many color variations (Plate 3C) are shown for the 0-bead (ca. 4.5 mm in diameter). For the most part, the Redlhammer cards are constructed so that the shape of the bead is shown (usually at the top) in various sizes (Plates 1D, 2A), while the specific shades of color for that particular bead appear below (Plates 2D, 3B). Some bead-mosaics provide a kind of color chart by themselves (Plate 3A) and a mix of colors becomes a matter of principle in necklaces made from late Riedel beads (Plate 14D).

The beads and bugles of all imaginable origins, arranged according to hue, give an idea of the many shades a color can have. Assembled by Maria Reiter over many years, her collection of small embroidery and knitting beads and bugles presents excellent illustrative material on the theme of colors in glass beads, even though only a small selection is shown here: white, gray, purple, blue, light green, dark green, yellow/orange, and pink/red (Plates 3D-5C). Venetian and Gablonz beads are close neighbors here, as are beads from the 19th and 20th centuries.

Striped, overlaid, and polychrome beads are shown in the assortment in Plate 5D and the colors of the larger, pressed, so-called Bohemian beads (also called "pipe" [*Röhrenperlen*]) are likewise shown in Plate 6A. An exhibition and a publication (Neuwirth 1993) have already been devoted to the colors of glass, their formulations, and special characteristics. The material there regarding hollow glass can be applied to solid glass beads as far as coloration in the batch, overlays, etc., are concerned, although special technologies have also been developed for solid glass beads.

Extensive color charts still exist today for tubes and bugles which contain hundreds of button-like samples. Those from Riedel in Polaun (today in Kufstein, Austria) and from the Hessenglashütte in Oberursel have been preserved in the Gablonz Archive and Museum, Kaufbeuren-Neugablonz. The developments in Historicism and Art Nouveau produced ever new subtleties, so that soon only the specialities were mentioned; Simm & Co., Polaun, for example, offered items "in all existing glass colors, especially in black, opal, blue opal, lapis, and bright yellow" (Arnold 1909:89). A list of glass rods with color names from the year 1940 has been handed down to us. All the color names are not given here because of the great number; a selection follows, however:

"Fine transparent colors:" Anna-yellow, rose, gypsy brown, hyacinth, new ruby, brilliant yellow, Anna-green, Montan blue, smoky topaz, violet blue, steel green, gray, ruby, lilac, champagne yellow, pink overlay, solid pink.

"Opaque colors:" opaque white, porcelain, ivory, turquoise, greenish turquoise, opaque green, "spath" green, opaque reseda green, opaque blue, gendarme blue, bluish gray, new blue, raven blue, night blue, opaque purple, pea green, Isabella, doe brown, vivid green, opaque gray, Japan yellow, pale pink, storm gray, linden green, lapis, enamel A and B.

"Opaque colors in yellow, red, brown:" opaque yellow, old and new, lemon, orange, coral, Marocco red, porcelain yellow, coral "B," rowan red, reddish-brown tango, Terra di Siena, chocolate, tea rose yellow, banana yellow, opaque pink, dark opaque pink, flesh pink, coral.

"Alabaster and alabaster colors:" alabaster white, rose alabaster, alabaster turquoise, chalcedony, alabaster blue, alabaster green, chrysoprase, alabaster yellow, alabaster yellow-orange, amber alabaster, lilac alabaster, jasper, carnelian.

"Opal and opaline colors:" white opal, opaque amber (cloudy amber), blue opal, aquarine opal, topaz opal, reseda-green opal, violet opal, Anna-green opal, Anna-yellow opal, gray opal, rose opal, brilliant opal, pink opal, lead opal.

"Satin-sheen rods:" satin-sheen rods, monochrome, smooth; satin-sheen rods combined, ribbed and moonshine.

"Agate rods:" amber agate, mother-of-pearl agate rods – solid color and striped, agate rods [listed with numbers].

"Rods of hollow and pressed glass:" antique colors, smoke, beryl, Japan topaz, antique Waterford, water blue, lilac, antique pink, violet blue, light violet, dark violet, iserin yellow, iserin rose, iserin blue, champagne yellow.

The mention of "striped rods" and "bicolored and tricolored rods" should permit a conjectural correlation between this list and the rod display of the Hessenglashütte at Oberursel (Plate 7D). A 1963 price list for rocailles from the Ludwig Breit Wiesenthalhütte glassworks in Schwäbisch-Gmünd has survived. It lists the following colors: "crystal, black, green, blue, amethyst, topaz, aquamarine, gray, amber, hyacinth, garnet, chalk, alabaster, opaque green, opaque blue, turquoise, opaque violet, opaque gray, opaque yellow, opaque orange, coral, opaque brown, opaque pink, and ivory;" 2-cut beads came in "crystal, black, topaz, green, blue, aqua, amber, hyacinth, garnet, coral, opaque yellow, opaque orange, opaque green, opaque blue, turquoise, Atlas white, Atlas aqua, blue, green, topaz," and bugles were supplied in "black, opaque white, coral, Atlas white" and in "certain opaque colors."

In addition to the list from 1940 in the Gablonz Archive and Museum (Kaufbeuren-Neugablonz), there is also a very interesting *Fachwörterbuch der Gablonzer Artikel in 5 Sprachen* ("Specialized Dictionary of Gablonz Articles in 5 Languages") which was made available to me. It was published in 1923 by the Cercle Polyglotte and no doubt intended for and used by the strongly export-oriented industry. It contains a two-page alphabetical color equivalence table. Only the German-English equivalents are presented here (Table 1).

Table 1. German-English Bead Color Names (1923).

German	English	German	English	German	English
achat	agate	heliotrop	heliotrope, lavender	rosalin	rose
alabaster	alabaster	himmelblau	sky	rot	red
amethyst	amethyst	iris	iridescent	rotbraun	red-brown
aquamarin	aquamarine	jaspis	jasper	rubin	ruby
aschgrau	ash-colored	karminrot	carmine	saphir	sapphire
bernstein	amber	königsblau	royal blue	schwarz	black
blutstein	blood-stone	kreideweiss	white as chalk	silber	silver
braun	brown	kristall	crystal	smaragd	emerald
braungelb	tan	kupfer	copper	stahl	steel
bronze	bronze	marineblau	navy, marine	taubenblau	dove-colored
carneol	cornelian, carneol	mondschein	moon-shine	topas	topaz
chrysopras	chrysoprasus	mondstein (sphinx)	sphinx	türkis	turkoise
corall	coral	montana		ultramarin	ultramarine
crême	cream	neurot	cherry red	violett	violet
elfenbein	ivory	nilgrün	nile green	weiss	white
fleischrot	incarnate, flesh colored	onyx	onyx	ziegelrot	brick-red
gelb	yellow	opal	opalescent	zitronengelb	lemon
gold	gold	orange	orange-tawny	dunkel	dark
granat	granat	oxid	oxid	hell	light
grau	grey	nilgrün	nile green	satt (weiss)	full (white), opaque
graublau	greyish blue	platin	platinum	durchsichtig	transparent
grün	green	reseda	reseda	matt	dull, frosted

Bead Coloring and Decoration

The delicate designs that appear to have been painted on a bead are in fact created with the thinnest of glass filaments formed into lines or dots and melted on, uniting with the bead surface as low reliefs (Plate 24A). Other techniques of decoration or coloration are not as durable and are particularly susceptible to mechanical damage and the effects of light. Some producers or finishers take the precaution of pointing out these characteristics (Plates 6D, 7A).

The technologies for decorating beads know innumerable variations, the most important being: painting, external coloring, color lining, gilding, silvering (mirror-coating), interior gilding, platinizing, iridizing, and lustering. For simplification, Parkert divides them into two groups: "surface decoration" and "inserted decoration" (Parkert 1925:152).

Painting

During the Biedermeier period, painted gold decoration on beads must have been especially popular: little gold stars adorn white and colored beads (Plate 18C) and thin-lined stylized leafy spirals wind around delicate hollow beads (Plate 21D). During the 1840s, Anton Blaschek was supposed to have decorated beads with little crosses or stars in gold and silver; they were melted in and then burnished (Parkert 1925:140; Posselt 1907:4).

It was natural for the Gablonz glass smallwares industry to use painting for decoration as well, probably already as early as the beginning of the 19th century, also in the sphere of influence of the refining and finishing districts of Haida and Steinschönau in northern Bohemia. Benda places the beginning of blown-bead painting in Gablonz in the 1820s, with constantly increasing importance into the 1860s and beyond. Next to Gablonz, Wiesenthal is supposed to have had the largest number of glass painters at its disposal. Most of the painters came from the area around Haida where they were chiefly put to work painting blown-glass beads: "At present almost all types of glass smallwares are decorated with painting, such as buttons, brooches, earrings, medallions, etc." (Benda 1877:285).

Bead painting, a highly developed artistic skill, eventually faded into the background. The increasing use of machinery from the late 19th century onwards to manufacture and color beads certainly did not encourage this method of decoration.

External Coloring

Glazing beads with the help of heat was already described in 1818:

> However, if they are to be coated with a glaze, this takes place over the fire in an iron vessel right after one sees that the pieces are suitably round. For the glaze, a prepared metal lime is used that suits the required color; you pulverize it very fine, add some calcinated borax so that it liquefies quickly and slowly sift it over the hot beads, stirring constantly and vigorously so that the powder adheres to each little bead; the mild heat causes the pulverized glass to melt, it adheres firmly to the bead and gives it the required color (Loysel 1818:305).

For comparison, Graeger (1868:120, 121) describes a method of coloring with "fugitive colors:" after the beads have been rounded in the tumbling drum, a finely ground colored enamel, along with some borax to make it melt more easily, is also added to the drum. This material "adheres to the softened surface of the bead, melts and finally, while one keeps it moving incessantly, clothes it with a colored coating."

Coloring the surface by dipping (etching) was established during the 20th century. This technique makes it possible to achieve shades of color that are practically impossible in batch-colored glass, but their durability is short-lived. Nevertheless, the range of colors is fascinating, especially when we take a look at the stained transparent or opaque beads (Plates 6D, 7A). Iridizing and lustering enhances their brilliance even more.

Color Lining

Beads made of crystal or colored glass were sometimes colored by coating the interior surface with some material, usually one with a very strong color. For a long time, the most important of the paint-lined beads were probably the coral-colored ones, since it was hard to achieve the desired color in glass. The fragility of this kind of coating is demonstrated by the flaking color on a broken "fruit" bead (Plate 20D bottom). According to Parkert (1925:142), coral-like coloring materials, which were used to line "chopped beads," consisted of minium (red lead) and Turkey red, rubbed together with turpentine and dammar. "Plain, smooth, blown beads of various colors of glass... were painted inside with cinnabar to give them a coral-like color" (Meissner 1954:6).

In 1871, the Schuster & Rögner Company in Gablonz was awarded a privilege (no. 21/672) for a process which they called *perles brillantes corail*. They used raw Venetian paste and brushed it with a mixture of copaiba balsam, oil of cloves, oil of turpentine, chemical preparations ("light coral red" and "dark coral red") from J.E. Devrient in Zwickau (Saxony) and glass paste "No. X" from J. Günzel in Haida. After the beads were dried, they were fired in a retort-kiln until they became shiny; this same manipulation (application, drying, firing) was repeated once more.

The most important technique was "insert painting," "on the string" or "in the pot." Two contemporary sources around the turn of the 20th century report their experiences. Pörner has also left us a drawing showing the workshop of a blown-beadmaker (Figure 14). He writes:

> My recollections only reach back to the years 1880-1885, etc. At that time, a lot of our beads were painted; they were called paint-in beads [*Einmaleperlen*]. The workplace for this was very simple. One needed: paint, a plate, a paint-rubber,

Figure 14. Workshop of a lamp blower (hollow glass beads), signed Pörner (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

> and a pigeon feather, trimmed on top to use as a brush. This brush was dipped into the paint and then one introduced the paint into the hole in the bead, tube, etc., and thus got beads of blue, green, coral red, etc., colors. Such interior-painters (bead colorers) could be seen frequently here in these parts (Pörner n.d.:3).

Posselt's description is even more detailed. Two- and three-cut beads, polished as well, and drawn tubular beads were decorated at the beginning of the 1850s in Morchenstern by lining them with lacquer paint:

> This was done either on the string or in the pot. The following process was usual for the former method: the color was rubbed in terpentine on a glass plate and dammar was added. A length of wool yarn was dipped into this paint or brushed with it, then tied to the end of a long string of beads and pulled through the beads while being diligently turned. For lining in the pot, the beads were dropped into a pot, the color poured over them and shaken until the necessary uniformity was achieved. After the beads were removed, the paint that had settled on the surface was halfway cleaned off with a linen cloth; the thorough cleaning was done with a linen cloth that had been dipped in a solution (water and soda) beforehand and wrung out. One needed considerably more color for this pot method. It was rubbed on a big, smooth, granite stone (Posselt 1907:4, 5).

Lining whole tubes with color was done starting in 1872, according to Posselt (1907:5). Up to the end of the 1860s, glass tubes were colored by sucking the paint up into them by mouth (Parkert 1925:151). Lining beads with color and silver was widely practiced at the beginning of the 20th century:

> Beads of naturally colored glass which are partially decorated from the inside show an inexhaustible number of variations in color and are especially interesting in regard to the way they are made. One technical expression for this is "painted-in beads." We find millions of silver-lined beads, crystal beads lined inside with silver and decorated on the outside, crystal beads with a brocade pattern inside... (Schindler 1906:1719).

More durable than the paints of the Biedermeier period were the aniline dyes which were preferred after the middle of the 19th century. Parkert (1925:179) gives more exact information on varnish paints and aniline dyes that were used for coloring beads:

> Coral-red colors: "Turkey red, cochineal varnish, and minium." Aniline dyes for red colors: "Diamond

> fuchsine (Bordeaux-red tone), ponceau red (scarlet-red tone), safranine red (for coral hues).” Green colors (“malachite green and methyl green”), yellow colors (“chrysoidine yellow, orange-yellow, and amber yellow”), brown (“chestnut and Havana brown), blue (“methyl blue”), violet (“methyl violet”).

For beads with pearl essence, the aniline dye was applied using ether collodium.

Exterior Gilding

Gold and silver coating is possible on both the exterior and the interior walls. Regarding the Venetian beads coated on the outside with precious metals (Plate 24C), Altmütter (1841:102) writes that real gold or silver foil was pressed onto the surface with cotton. The surface was moistened beforehand with a solution of borax mixed with gum arabic in water or a mixture of gum arabic and gum ammoniac. These prepared beads were heated in a pan with finely ground quicklime and finally rubbed with soft leather.

On 20 October 1828, Cavaliere Marino Longo was awarded a five-year privilege “for the invention of a new way to gild and silver coat glass beads,” which was, however, rescinded in 1830 because the fees were not paid. “The beads, hanging from a string or wire, are first coated with a watery varnish of gum arabic and borax, encased with fine gold or silver foil, and then subjected to rather strong heat for one hour” (Patents 1841, 1:9).

In 1925, Parkert also refers to exterior and interior gilding on blown-glass beads; according to his reports, simple burnished gilding done as exterior gilding is “achieved with a solution of gold in sulfur balsam and oil of lavender, aided by bismuth as a flux” (Parkert 1925:165).

Dr. Ivan Weiskopf achieved reddish-gold colors as “copper coatings made by reducing the copper hydroxide through the presence of chlorides of zinc, gold, and platinum in a solution which contained cane sugar and formaldehyde” (Parkert 1925:167).

Silvering (Mirror Coating)

The following report from the 19th century concerns beads “with a metallic appearance:”

> Sometimes one also sees beads which have a metallic appearance; these are coated on the inside with the amalgam described below and are handled like the larger glass spheres whose coating is mentioned later. When the beads are made of colored glass, the coating also takes on this color. Also before the beads are coated, one can line them on the inside with a paint to which gum has been added and then the coating done on top of it. Such beads have to be made of thicker glass than the wax beads (Loysel 1818:309).

Without going into detail, Keess speaks in 1823 of “metallic composition” for making “shiny metallic marcasite or mirror [*Spiegelperlen*] beads” (Keess 1823:902). Loth also only mentions. that “the silvered beads... contain a coating of a metal mixture with a low melting point.” Leng, however, mentions melted tin:

> ... in the shiny metallic marcasite or mirror beads, metallic compositions such as are used for silver coating glass balls [are] blown in. If one takes a bead that has just been blown and is still hanging on the tube in a glowing state, and holds it in melted tin and draws some of it into the tube so that it can be blown back into the bead again, it gets a thin coating inside and shows a beautiful play of colors (Leng 1835:502).

Pörner also mentions mirror beads colored with tin:

> After the war of 1866, there was another bead that could be seen here: the so-called mirror bead. These beads were blown in a row into a glass tube, about 20 6mm-beads on the one half, the same amount on the other half, and this row [*Klautsche*] of beads was bent in the middle, heated in the flame, and lined with tin and pewter, then heated again and the residue of tin blown out again. Finally these beads were strung on threads. These beads were shiny like platinum-steel.... The beads lined with tin and pewter were completely displaced and replaced by the silver-coated beads (Pörner n.d.:3, 4).

As the sources quoted here show, beads with reflective coatings on their interior walls were known at the beginning of the 19th century as marcasite or mirror beads. The beads of a necklace by Anton Schwefel (Plate 21B) are also labeled as such (in the *Universal Lexicon* by Heinrich Zedler, marcasite is described as “a metal-like mineral,” of which there are “various kinds:” gold, silver, copper, tin, or bismuth marcasite) (Zedler 1739: column 1184).

The metal mixture used for glass beads, according to Altmütter, consisted of...

> 8 drams bismuth, 1/2 dram lead, the same amount of tin, and 9 drams pure quicksilver. The beads are blown so that they form a row 4 to 5 inches long and between each bead only as much space is left

> as is required for cutting them apart later. Such a row is heated, the lower end placed in the liquid metal mixture while one sucks on the top, as a result of which it fills up with the metal. One blows the leftover metal out again and finally cuts the tubes into individual beads. To protect one's health because of the quicksilver vapors, it would be advisable not to suck with the mouth but to accomplish the procedure with the help of a little syringe or pump (Altmütter 1841:88).

Beads made from colored, transparent glass tubes (yellow, red, blue, or violet) were also treated in this manner (Altmütter 1841:88). A number of authors agree in designating 1858 as the year in which silver lining by the warm method was introduced (Parkert 1925:140; Posselt 1907:5); Arnold (1909:90) places it in the year 1857. Using oil of cloves caused such strong odors that silver coating by the cold method (according to the Liebig process) soon took its place (Parkert 1925:140). Posselt (1907:5) names Emanuel Fischer in this connection, while Meissner points to Weiskopf who substituted the lead-tin alloy with silver nitrate:

> It was known for a long time that when the aldehyde is heated in a tube with silver ammonium nitrate, it reduces the silver oxide and the metal precipitates as a shiny coating on the inside of the tube... 6 months ago Drayton's process became known, according to which mirror surfaces can be covered with silver coating using a cold process with the help of silver ammonium nitrate and a solution of clove and cassia oil in alcohol. Also in the first quarter of the 19th century there was already a certain parallel development in the decoration of blown beads and mirror production, since this kind of bead was also coated with a reflecting lead and tin alloy.
>
> Not until after 1855 did silver coating become completely practical by using the silver coating liquids prescribed by Petitjean and Liebig; this improved method of production, the so-called cold-method silver coating, was immediately tested and implemented by Weiskopf. As a result, the bead business experienced an undreamed of upswing. Whereas before this no Austrian product had been able to boast of such widely distributed sales as the Bohemian glass bead, the metallized bead now made its triumphant march across the whole world.... The silver solution used for lining beads could be bought back then from the pharmacist, Ullrich, later also from the Weiskopf chemical factory in Morchenstern. In 1868, Hartwig Weiskopf had applied to the Gablonz district authorities for permission to manufacture chemicals... (Meissner 1954:6, 7).

According to Benda, the application of a mirror coating to drawn beads was invented in Morchenstern:

> An additional decoration is achieved by lining the inside walls of blown glass tubes with silver, whereby the beads acquire a silver mirror-like appearance, and when yellow glass is used, one similar to gold. This mirror-coating for drawn beads was invented in the year 1853, in Morchenstern, where an outside assistant taught the beadmakers... (Benda 1877:284, 285).

The early practice of sucking the silver solution into the bead by mouth resulted in agriosis, the blue to black discoloration caused by silver deposits in the skin (Parkert 1925:141). The "Moors of the Mountains" (Winter 1900:77) was the name given to these unfortunate people who suffered from this occupational disease. As a result, attempts were made to use simple suction devices with rubber pressure. The disadvantage, however, was that each bead had to be lined separately. In 1878, a toolmaker is supposed to have introduced a lining machine (Lilie 1895:165, 166). This process was improved by Parkert (Figure 15). Using the principle of communicating tubes, it was possible to silver coat the glass tubes in bundles (Parkert 1925:141, 142).

Towards the end of the 19th century, silver electroplating was also mentioned:

> Very beautiful wares are also produced by galvanic silver coating. Since glass as such does not conduct electricity, no metal would precipitate onto a naked glass surface so it is necessary to make the glass conductive beforehand. This is done with a shiny platinum coating or better, with a simple luster. This

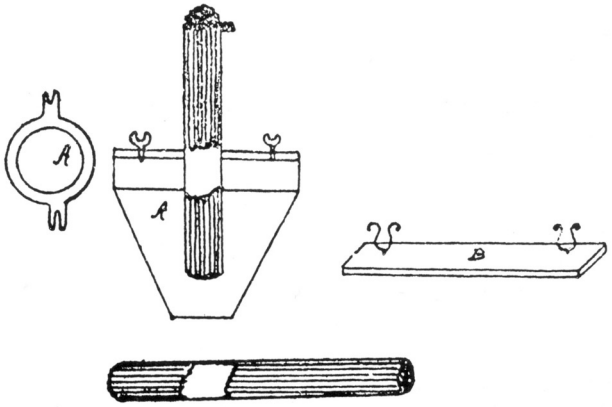


Figure 15. Device for inserting silvering into beads (Parkert 1925:141, Figure 30).

> makes the glass conductive and the electroplated beads are in no way inferior in appearance to true silver beads (S.L. 1896:606).

In 1888, Ignaz Finger from Brunn am Gebirge in Austria received a privilege (no. 38/2989) for an improvement in the "production of silver coated glass beads." He succeeded in making perfectly round silvered glass beads using the following method: each single sphere was broken off with a sharp steel device right after it was blown from a glass tube. This produced a perfectly smooth opening, whereas the beads blown in a row (*Klautschen*) had little cylindrical necks at the hole. The silvering itself was done in a bath. Afterwards Finger removed the outer coating by shaking the beads in a sack with bran and polished the outer surfaces.

Interior Gilding

Ever since they first appeared, being able to make the so-called "Parisian fine-gold beads" and "Real Gold Gilt Beads" (Gablonz Archive and Museum n.d.a) was a goal producers of blown beads wanted very much to achieve. A bead that looked like gold could be made in two different ways: by the cheaper method of lining topaz-colored glass with silver or by inserting gold into crystal glass. According to Parkert, true interior gilding was done with a gold chloride solution mixed with a soda solution to which chemically pure glycerine and water were added. According to Parkert (1925:165-167), using pale yellow transparent glass with a silver lining resulted in golden beads with a striking yellowish-red shine.

Meissner attributes the true gilding of blown beads to the Weiskopf Company in Morchenstern:

> Dr. Weiskopf put the real gold bead or fine gold bead on the market; it was an important addition in supplying the world with metallized beads from the Gablonz industry area. What had previously been a Parisian asset, Weiskopf accomplished so well that it entered into competition with the Parisian products.... Dr. Weiskopf's own business also flourished: both the true gilded blown beads and the gilded and silvered rocailles sold very well... (Meissner 1954:22, 30).

Equating the fine gold bead with the real gold bead, as Meissner does here, contradicts the terminology of other writers, as the following shows: "Zenkner, Josefsthal, and Pörner Franz, among others... made copper-like blown bugles which acquired a golden appearance after being coated with a silver lining; they called this article 'fine gold beads'" (Pörner n.d.:3).

In 1896, Gustav Schneider in Antoniwald obtained a privilege (no. 46/4066) for a "process for making gold, copper, and fine gold beads" without using gold. The outside or inside surfaces were coated with metal luster, metal salts or metal powder, silver alloys, and other preparations. Besides, Schneider differentiated between gold beads (crystal glass with interior gilding) and copper and fine-gold beads which he called composition beads (made from tubes of colored glass with a silver coating).

Platinizing

At the German-Bohemian Exhibition in Reichenberg (1906), Dr. Weiskopf & Co. of Morchenstern exhibited "crystal beads colored with aniline and externally gilded or platinized beads of black glass" (Arnold 1909:89). The Riedel company in Polaun and Josefsthal made glass canes in a transparent gray color. When beads were blown from this glass and lined with silver, one got the most beautiful steel-platinum beads very cheaply (Porner n.d.:3).

Iridizing and Lustering

Iridizing beads seems to have become common at about the same time as the iridizing of hollow glassware, namely about the time of the Vienna World's Fair (1873). Iridizing was invented around the middle of the 19th century (1856) by the chemist L.V. Pántotsek for the J.G. Zahn glass factory in Zlatno in Hungary (Neuwirth 1973:45, 1986:277-299). While Brianchon became famous in France for his iridizing, great importance was attached in the Gablonz area to the Weiskopf company in Morchenstern.

As far as seed beads are concerned, the terms "iris" and "luster" are defined in glass-bead terminology as follows (Gablonz Archive and Museum n.d.b): luster gives the bead made from alabaster glass the matte sheen of real pearls and on black glass the result is iridescence (as a reflection in rainbow colors). While the iridescent effect on beads is the same as for hollow glassware, bead luster appears to be diametrically opposed to luster on ceramics and glass, if we think of the Spanish-Moorish luster faiences, copper-luster on porcelains, and lustered Art Nouveau glasses (Lötz, Tiffany).

In a French report on the Vienna World's Fair, the beads of Bapterosses are highly praised, especially those with the *lustres nacrés* by Brianchon (Vienna 1875:50). The introduction of iridizing by Paul Weiskopf created in Morchenstern...

> a new line of business, which spread from here into the neighborhood and has held on to the present

> day. Realizing correctly that iridescent glass would come into fashion, one started iridizing mostly seed beads and a few jewelry articles (the bijouterie-wares producer Josef Ullmann in Morchenstern was the first to try iridescence on jewelry and buttons). Paul Weiskopf supplied the necessary chemicals or got them from somewhere else....
>
> Other metallic-reflection effects such as luster were used for decoration. The results of fortunate coincidences were exploited and led to specialization in the business and so this branch of work has lasted up to the present. The equipment, the iridizing drum or muffle, is fairly simple to use; a kiln was also needed for the rest of the procedure... (Meissner 1954:22).

The company Zimmermann & Weiskopf in Morchenstern, which was registered in 1876 after the death of Hartwig Weiskopf, printed business cards listing numerous "chemical products for decorating glass, porcelain and ceramic wares: vitrifiable and luster colors; chemicals for gilding, silver coating, platinizing and etching; enamel colors, aniline dyes, aniline paint dyes, adhesives, etc."

Meissner pointed expressly to Weiskopf's products and their importance:

> Iris and luster, and different metallic reflexes [Plate 10B] were very much the fashion for decorating beads and other jewelry articles, also gilding and silver coating for seed beads, and for that reason the demand for chemicals for these purposes increased enormously... (Meissner 1954:22).

In 1886, Duisburg & Co. in Gablonz and Anton Bröckner in Morchenstern were awarded a privilege (no. 36/1586) for a process for achieving a mother-of-pearl effect on glass buttons, glass beads, and similar glass products by "incorporating iridescent glass clumps, pieces of glass or glass beads into the glass batch."

Iridizing and lustering, developed during the Historicism period, became one of the characteristic Art Nouveau finishing techniques, also used for glass and porcelain beads. A display of these achievements was provided at the German-Bohemian Exhibition in Reichenberg. Here Joh. Pitter of Neudorf showed innumerable drawn beads: "About 100 of the many color effects are presented and achieve various lusters or iridescent effects by firing" (Arnold 1909:89, 90). The pressed beads from the Pitter Company were, "for additional refining,... cut, iridized, decorated with melted-on "brocade glitter" or rapidly cooled after pressing so that the surface becomes strangely crackled" (Arnold 1909:92). One can presume that this company was one of many which made use of iridescent and lustered effects, which were also very well received throughout the Art Nouveau period and into the Art Deco period between the two wars.

An excerpt from a list of products found in a contemporary source from 1930 appears to be characteristic for the period: The chemical laboratory of Anton Rössler in Gablonz, founded in 1919, produced silver nitrate and gold chloride for processing blown beads and imitation stones using the wet method, also bright gold and silver luster for exterior metallizing of glass and porcelain wares (Lodgman and Stein 1930:387).

Gustav Keil in Gablonz also had an extensive listing to point to:

> Fabrication of solid French beads. Strung beads from the plainest to the finest execution in oriental-iris for jewelers, etc., etc., wax gems and components for jewelry, iris bugles, pears, buttons, stones, single and double hole, smooth, baroque, etc., in all shapes (Lodgman and Stein 1930:414).

One of the most important companies was the glass-bead factory of J.G. Schöler in Wiesental a. N. Founded in 1884 and expanded during 1925-1927, it employed 25 executives and workers along with 80 cottage workers. Their products included:

> Glass beads and bugles of all types which are used for dress trimmings, hat ornaments, lamp fringes, ornaments, embroideries, etc. In addition to the modern glass-bead coloring works, glass beads and bugles are lustered, iridized, and electroplated in an adjacent building (Lodgman and Stein 1930:434).

BEAD SIZES

The sizes of Gablonz beads ranged "from the smallest bead visible to the naked eye, to the nut and pigeon-egg sized beads, in all colors and shapes..." (Winter 1900:8, 9). This poetic description corresponded to a system of numbering at whose center lay the null-bead (0-bead). The smaller beads ("under null") were indicated by zeroes (i.e., 0-00-000-0000) although for the sake of simplicity the manner of writing them as 2/0 (00) to 20/0 (20 zeroes) was preferred. The fact that this numbering system is not mentioned by Karklins is conspicuous. Karklins (1985:113) himself deemed the five size categories proposed by Kenneth and Martha Kidd (very small, under 2 mm; small, 2-4 mm; medium, 4-6 mm; large, 6-10 mm; over 10 mm) insufficient.

Grouping beads according to size was necessary for various reasons. The raw product for making beads (rods, tubes, and canes) had to be sorted, usually according to

diameter. The bead blower used a measuring device (Figure 16) in making blown beads. The finished beads could be sorted by putting them through seven differently sized holes and, finally, a bead gauge was used to measure the beads. We have Ludwig Breit to thank for important information on the sorting of glass canes and the making of the sieves for sorting the finished beads:

> The... collected bundles were brought to the big sorting room; there the individual thickness of the canes was sorted with sorting machines. The women working there were extremely adept at placing the canes on moving chains that transported the canes across holes with very exact sizes; these were set at gradations of 2 tenths of a millimeter. The diameters of the individual canes were prescribed as follows:
>
> | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 30 | 35 | 40 | 50 | etc. |
> |---|---|---|---|---|---|---|---|---|---|---|---|
> | 14-13/0 | 13-14/0 | 11-12/0 | 11/0 | 10/0 | 9/0 | 8/0 | and thicker | | | | |
>
> The bottom row shows the sizes of the beads that are usually expected of canes.... The finished heat-rounded beads... were then taken to the bead siever. Sieving was done with shaking machines that were equipped with 4 to 5 metal sieves (ca. 50 x 30 cm in size) with holes to separate the individual beads. The sieves were made of thin galvanized sheet iron. Before we made the sieves in our workshop ourselves, we got them from the famous sieve-maker, Josef Stecker of Hochstadt in the Riesengebirge. Stecker was a Czech and made his sieves almost exclusively for all the various requirements of the Gablonz industry. The man had the most primitive equipment possible for making these metal sieves. From a strong leaf spring there hung a punch which he moved up and down with his foot so that the punch fell upon the metal several times a second. He pushed the metal sheet back and forth with his hand so skillfully that he finished one metal sieve in about 15 to 20 minutes. How he managed to punch out the holes of the sieve so that they were almost exactly evenly spaced is a puzzle to me (Breit 1987-1990:69, 70).

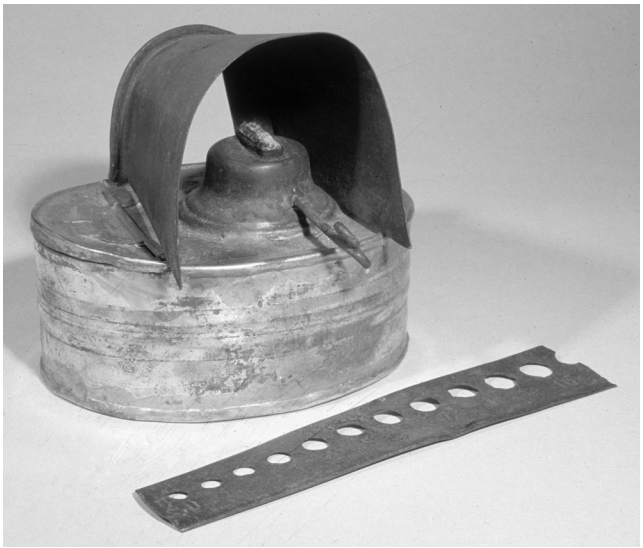


Figure 16. Lamp and measuring device for a blower of hollow glass beads; height (lamp): 11.3 cm; length (measuring device): 16.7 cm (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

If we seek to pursue the numbering systems for the sizing of beads chronologically, we find the oldest examples of Bohemian provenance among the Gablonz beads of the Biedermeier period. I know of no comparable, early concordances of Venetian beads. The printed sources available to me and the sample books from Barbaria and Barbini from the beginning of the 19th century (Technical Museum Vienna, TH 32865, 32744) do contain consecutive numbers for the corresponding samples, but no number/size equivalents. Bussolin (1847:23) and Zanetti (1874:131) only mention sieves that sort the beads according to size. Only in Keess (1823:904) was I able to find a reference to Venetian blown beads "in 15 different numbers."

Zanetti classifies beads according to the quality: *fine* (fine), *mezzo fine* (medium fine), *piombo* (lead), *vetro* (glass), *nero* (black), and according to size: *collane, cannettine, cannette da 3, 3½, da 4, 5, e da ½*. The French called the *collane, charlottes* or *rocailles* depending on their size (Zanetti 1874:133).

In contrast to these vague specifications, the sizes of Bohemian Biedermeier beads are more exactly defined. The solid and blown beads on a sample card from Ferdinand Unger in Liebenau (Figures 17-18) are labeled in so-called graduated sizes from 4/0 to 24. These graduated sizes or their fractions were normally measured with the "French line" (or "Parisian line"): 1 foot = 12 inches = 144 lines; e.g., 1 inch = 12 lines. The millimeter equivalent for the lines differed from country to country: 1 Parisian line = 2.2558 mm, 1 Rhine line = 2.179 mm, 1 Viennese line = 2.195 mm, 1 English or Russian line = 2.116 mm (Meyer 1877:840).

Basically, the sizes on the Unger sample cards – especially the one showing the faceted beads – are identical to the measurements listed by Kleinert (*see* below) for mold-pressed beads (diameter of the 0-bead: 2 lines = 4.5 mm). Deviations can be observed among the blown beads (Series Q, in certain areas, between one- and ten-tenths[!] of a millimeter larger) and the coral beads and coral olives (Series L, P, larger). It is worth noting that the olive beads

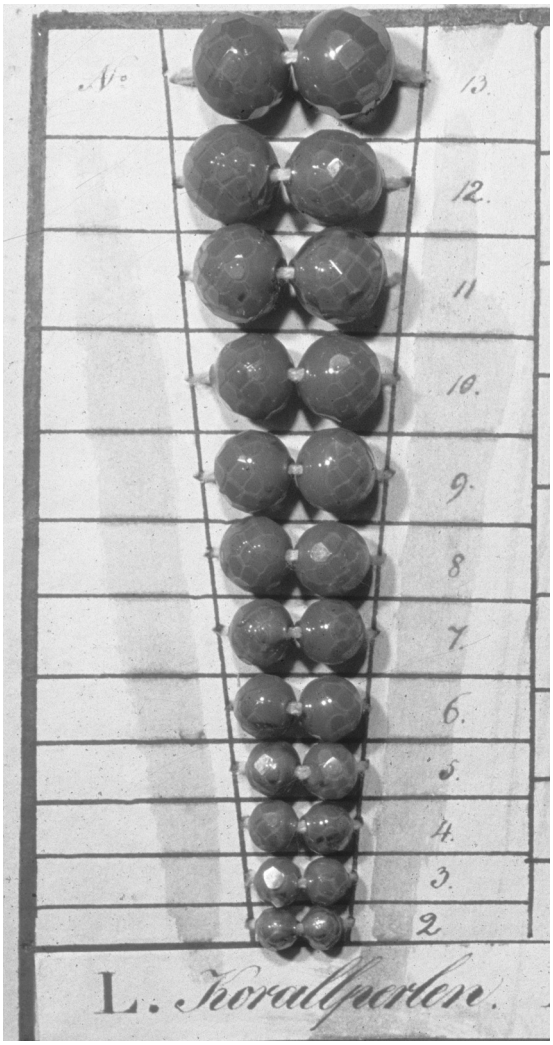


Figure 17. Bead-size card (nos. 2-13); F. Unger, Liebenau, prior to 1839; original size (Technical Museum Vienna [TMV], TH 34341).

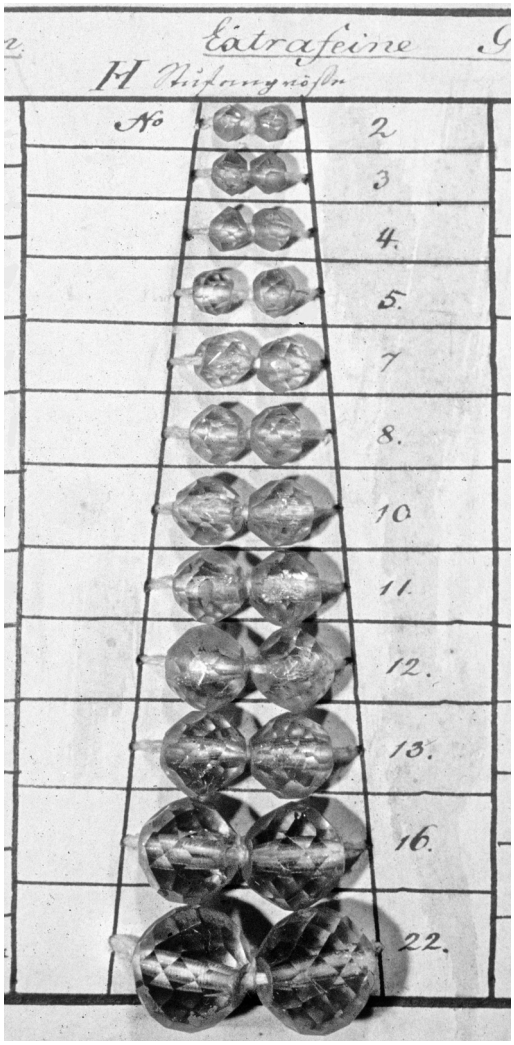


Figure 18. Bead-size card (nos. 2-5, 7, 8, 10-13, 16, 22); F. Unger, Liebenau, prior to 1839; original size (TMV, TH 34341).

were apparently measured differently; while the size of satin olives was based on diameter, the garnet olives and coral olives were measured according to length (Series K, P: as a whole, somewhat larger).

The diameter of faceted beads is easier to measure the finer they are cut; 3-cut beads or irregularly cut beads make exact measurement more difficult. Therefore one must reckon with certain tolerances amounting to as much as several tenths of a millimeter. Divided into bead types, the Unger sample card includes the following sizes:

A - Glass beads with 3 facets: size gradation 0-12
C - Lapis lazuli beads with 3 facets: 0-12
D - Glass beads with 5 facets: 0-12
E - Fine composition beads, ruby: 0-12
F - Fine composition beads, garnet: 0-12
H - Extra-fine glass beads: 2-5, 7, 8, 10-13, 16, 22
K - Garnet olives: 4/0, 3/0, 2/0, 0-9
L - Coral beads: 2-13
M - Wound satin beads: 9-17
N - Satin beads: 5, 7-13, 17
O - Satin olives: 3-5, 7-12
P - Fine coral olives: 0-11
Q - Silver or gold beads: 4-7, 10, 13, 15, 20, 22, 24

Bead samples in graduated sizes from 4/0, 3/0, 2/0 to 15 are contained in a different collection (this time in book form) by Unger of Liebenau (Figure 19). Apparently several mistakes occurred in stringing the beads, since numbers 6 and 7 of the blue faceted beads appear to have been switched and numbers 12-14 are practically the same size; the red

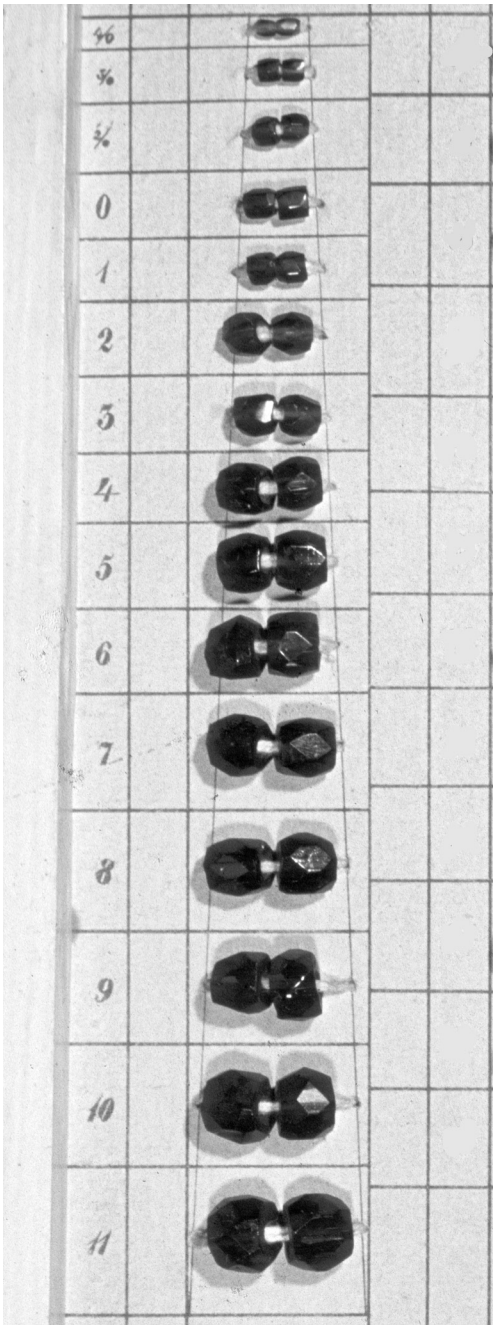


Figure 19. Cut beads (nos. 4/0 to 11); F. Unger, Liebenau, prior to 1839; original size (TMV, TH 32748).

faceted beads are accurately assigned to sizes. Taking these apparent mistakes into account, an assumed graduated system produces averages that correspond approximately to those of Kleinert.

Cut beads in number sizes from 000 to 15 are shown on a sample card from Stephan Hellmich (Wolfersdorf) which likely dates to the last quarter of the 19th century (Figure

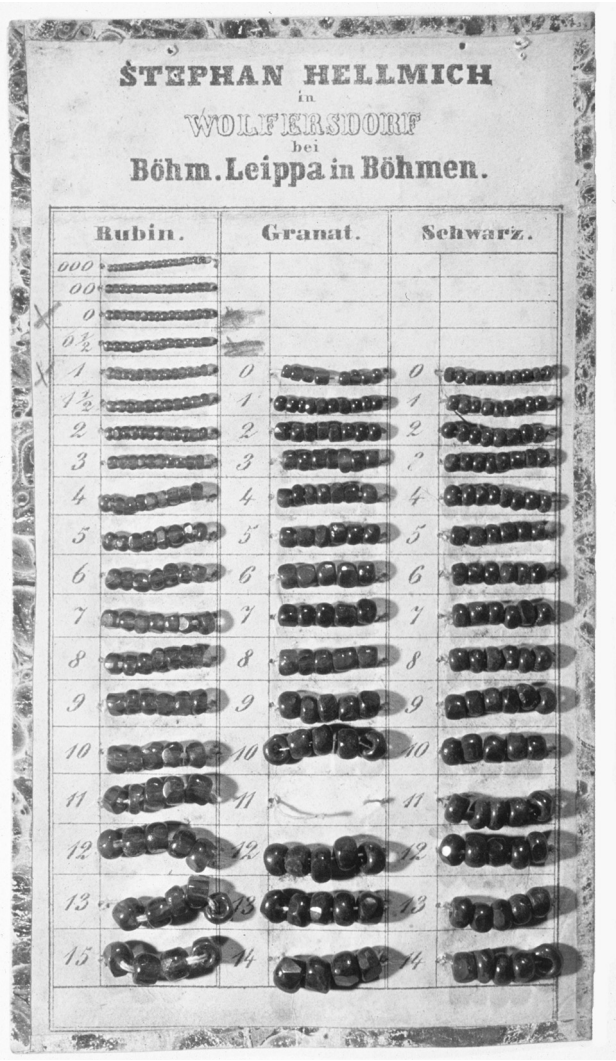


Figure 20. Sample card from S. Hellmich, Wolfersdorf, probably last quarter 19th century; 13.6 x 7.7 cm (original size) (Museum for Nature and Urban Culture, Schwäbisch-Gmünd).

20). The intermediary sizes, 0 ½ and 1 ½, were even used here. These number sizes are not the same as those of Unger or Kleinert: the "0-bead" – normally one with a diameter of 2 lines (4.5 mm) – on the Hellmich card measures about 1.40 mm; i.e., less than a third the size of the Unger beads. The situation becomes even more confusing with the observation that the Hellmich 0-bead does approximately have the aforementioned 1.40 mm diameter in garnet beads, but not in the black beads which measure ca. 1.9-2.0 mm.

Unfortunately, one sample card of blown beads listed in the inventory as "a small sample card with white blown-glass beads in 19 sizes; unknown" (Plate 20C) is not as clear about its provenance as the cards from Gablonz. Blown-bead production was widespread so assigning it

to a specific region is very problematical. The numbered beads, diminishing in size from 1 to 19, have the following measurements in millimeters, although one must take into account that the beads strung in a row and labelled with a number can often differ from one another in size by as much as one-tenth of a millimeter.

The largest size (ca.)...	is about the same as Kleinert's
No. 1 = 11.5	12
No. 2 = 10.5	11
No. 3 = 10	9
No. 4 = 9	8
No. 5 = 8.5	7
No. 6 = 7.5	5
No. 7 = 6.8	4
No. 8 = 6.2	3
No. 9 = 5.7	2
No. 10 = 5.2	1
No. 11 = 4.7	0
No. 12 = 4.2	
No. 13 = 3.8	2/0
No. 14 = 3.4	3/0
No. 15 = 3.1	
No. 16 = 2.8	4/0
No. 17 = 2.5	
No. 18 = 2.1-2.2	
No. 19 = 1.9-2.0	

Blown, drawn, and mold-pressed beads naturally did not achieve the miniscule size no. 20/0 of pearls, but could go up to the impressive size of no. 24.

According to Posselt (1907:16), the "number system for mold-pressed beads... [was] different from that used for drawn beads; it started with no. 0. No. 0 for the mold-pressed bead is about half the size of a no. 0 drawn bead." I was not able to confirm this statement, but Posselt's claim is sometimes accepted uncritically in specialized literature. The size of the so-called "null-bead" (0-bead) was apparently not valid universally. According to Kleinert (1972:54), size 0 pressed beads had a diameter of 2 1ines (1 line = 2.25 mm), therefore 4.50 mm. A different source gives the 0-bead a diameter of 4 mm (Gablonz 1897:81) and Parkert (1925:140) describes the measurements of the 2/0 bead as "2 lines long and 2 lines thick."

Blown beads came in innumerable types and shapes: "According to size, one divides them into numbers, and there are 10 numbers below 0, whereby the 0-bead follows with a diameter of 2 lines. For numbers 1-20, the diameter increases each step by 1/4 line" (Tayenthal 1900:24; comparable to Hannich 1931:60).

The sample cards of the Redlhammer Brothers and the Mahla Brothers probably date from the beginning of the 20th century. They, too, include sizes, both in numbers and in millimeters, that were better suited for certain kinds of beads (e.g., elongated beads, oval beads, etc.). The sizes on the Vienna Redlhammer series go from 4/0 to 12, with an in-between size of 11½; the range of sizes in greatest demand went from 3/0 to 9. One Redlhammer card (no. 166) provides a color scheme that shows the shades of color in the uniform size of the 0-bead (Plate 3C). The cylindrical beads on a different card (no. 124) are listed in millimeter sizes (3-10 mm) (Plate 30B).

The Mahla cards contain all three size standards: number, line, and millimeter measurements! The number system is used for round and oval beads (Plate 45A), faceted solid beads (Plates 45B-C, 46A-B), and specific hollow beads (round with color lining [Plate 47C]; faceted gold beads [Plate 47B]; golden melon beads [Plate 48B]; and Atlas beads [Plates 46C, 47A]). Millimeter sizes distinguish the cubic blown beads (Plate 49C), the internally ribbed melon beads (Plate 48C), and beads with different kinds of internal ribbing (Plate 49B). We find the three superscript lines belonging to the line system used for bugles (Plate 43B) and for different kinds of olives (smooth four-cornered olives [Plate 44B] and blown glass olives with color linings [Plate 48A]).

All of the abovementioned variations (the number system and measurements in millimeters and lines) are found on sample cards of more recent date, most of which probably postdate the Second World War. The reliable number system apparently continued to be used wherever it seemed practical. For a certain sector (metalized blown beads), Schander ([1954]:7) adds a comparison of the (older) number system and the (newer) metric system: no. 4/0 (old) = 2 mm (new), 3/0 = 3 mm, 2/0 = 4 mm, 1 = 5 mm, 2 = 6 mm, 3 = 7 mm. We find the best – and already frequently referred to – overview of the sizes of mold-pressed beads according to the old and the new systems in Kleinert (1972:54), who got corresponding documents from an old printer:

> Up to the 1930s, the "kernels" [*Kernl*] were measured by numbers, the "*Seitnzeug*" according to lines. Since these systems have mostly been forgotten today, the following table [Table 2] is intended to show a list of these earlier measuring units. When using the "kernel" number, the "kernel" was called the "double-null kernel," "null-kernel," "one-kernel," and so on.

Table 2. Overview of Units of Measure Previously Used for Machine-made Articles (1 Line = 2.25 mm; 1 "Kernel" Number = 1/4 Line).

"Kernel" Number	Lines	Millimeters	"Kernel" Number	Lines	Millimeters
0000	1 ¼	2.81	9	4 ¼	9.56
000	1 ½	3.37	10	4 ½	10.13
00	1 ¾	3.94	11	4 ¾	10.69
0	2	4.50	12	5	11.25
1	2 ¼	5.06	13	5 ¼	11.81
2	2 ½	5.63	14	5 ½	12.38
3	2¾	6.19	15	5 ¾	12.96
4	3	6.75	16	6	13.50
5	3 ¼	7.31	17	6 ¼	14.06
6	3 ½	7.88	18	6 ½	14.63
7	3 ¾	8.44	19	6 ¾	15.19
8	4	9.00	20	7	15.75 etc.

Measuring devices for the bead industry have survived (Figure 21) in Neugablonz, and the sizes range from 1-62 (1 is the smallest size, 62 is the largest). There were also tools for counting beads (Figure 22).

Rocaille Sizes

The term "rocaille" was mostly used as a synonym for small (rounded) beads in sizes from nos. 20/0 to 10; i.e., from the size of a "millet seed to one of a small hazelnut" (Zenkner 1983:110). The name embroidery bead (*Stickperle*) designated small rocailles with a diameter of less than 1.5 mm (nos. 12/0 to 20/0)(Gablonz Archive and Museum n.d.b). The "charlottes" were the very smallest beads.

According to Ludwig Breit (n.d.a:4), the smallest bead (20/0) had a diameter of 0.8 mm while the largest made by the "rounding" method was about 10 mm in diameter. With the help of information from Breit and other sources, it is possible to draw up the following size concordance (Table 3), which we may not regard as universally valid, however.

Table 3. Size Concordance for Beads.

Size	Millimeters	Size	Millimeters	Size	Millimeters	Size	Millimeters
20/0	0.8	11/0	2.1	4/0	5.0	4	8.5
19/0	1.0	10/0	2.5	3/0	5.5	5	9.0
18/0	1.1	9/0	2.7	2/0	6.0	6	9.5
16/0	1.3	8/0	3.1	0	6.5	7	10.0
14/0	1.6	7/0	3.4	1	7.0	8	10.5
13/0	1.7	6/0	4.0	2	7.5	etc.	
12/0	1.9	5/0	4.5	3	8.0		

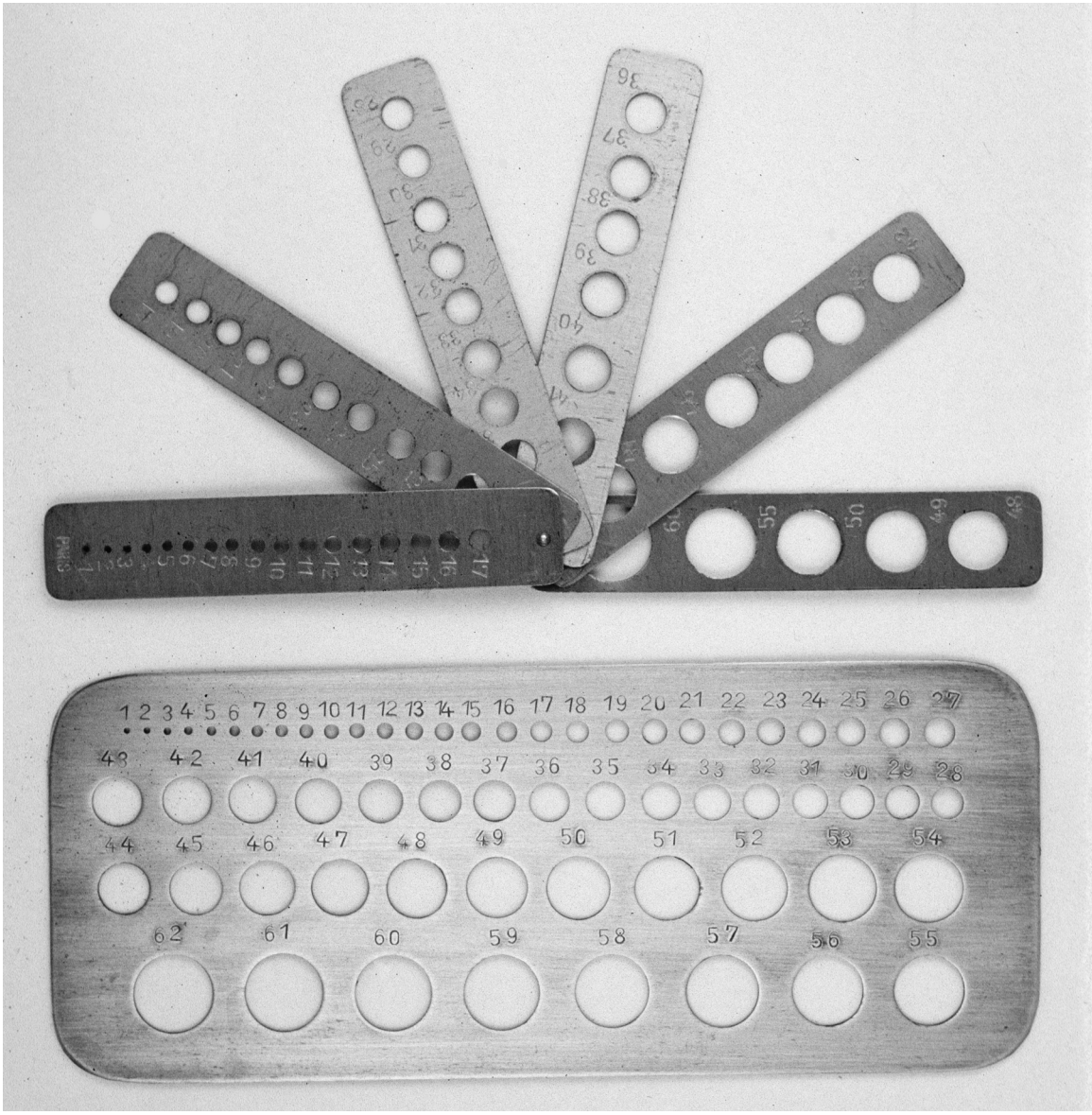


Figure 21. Measuring devices for the bead industry, nos. 1-62 (no. 20 = ca. 4.5 mm = 0-bead), Wenzel Stracke, Kaufbeuren-Neugablonz, about 1955.

Virginia Blakelock (1994:37) provides an overview of modern Czech bead sizes (from 20/0 = 1.0 mm to 10/0 = 2.3 mm) that deviates only slightly from the above.

Sample cards from different provenances provide stark proof of the lack of uniformity in the numbering system. Even within the one and the same company, striking deviations or changes were possible, such as the renumbering of the rocailles, as evidenced by article no. 1004 of the Breit Company in Schwäbisch-Gmünd. In one instance, a card with white rocailles (Figure 23) shows sizes 10/0 to 8 printed on the left side and on the right are numbers written in by hand which change the 5/0 into 15/0 and continue the changes up to size no. 6 (which becomes a 5/0).

Both vertical rows of numbers are then found already printed on a different card (Figure 24). Whether the older specifications go back to the time of the old Breit factory in Bohemia can no longer be ascertained. The numbers 13/0 to 8/0 are also written in by hand for black and white rocailles on another card (Figure 25), although the differences between the sizes listed for the black and the white beads are quite noticeable. The green rocailles (Figure 26) appear to match the altered number systems. Sometimes people

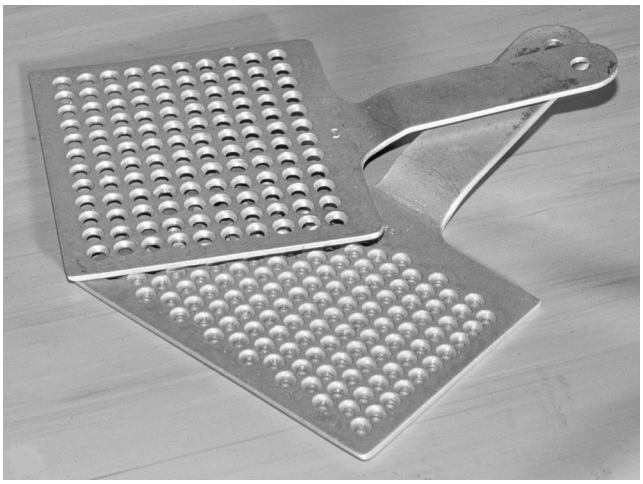


Figure 22. Shovel-shaped devices for counting beads (Ilse Kratzmann Company, lampbead factory, Enns (Upper Austria).

had a hard time with the sizes listed on unfamiliar sample cards and tried to contrive a concordance according to their own system, as notes made in pencil indicate (Figure 27). If additional proof had been required for the variability in sizing systems, this would most likely have sufficed.

Tiny beads appear under the name "Rocailles and Seed Beads" on a sample card from the "Czechoslovak Glass Export Co., Ltd.," in Gablonz, Bohemia (after 1945) in sizes 18/0 to 5/0 (Figure 28). Sample cards from an unknown company show bugles in lengths from 1 to 4 (1-4 lines)(Figure 29). The bugles from the Breit company in Schwäbisch-Gmünd are labeled as 1 to 10 and 4x25 (Figure 30).

From the accounts of Ludwig Breit, we learn that the ballotini (made from ground glass fragments, sieved and rounded), had their own numbering system, probably because of their extremely small size: "...the size most used was the small size, no. 8. The different sizes were 10, the smallest no. 8, the most popular nos. 7, 6, and 5. Beads no. 10 and no. 8 were smaller than 1 mm. Sizes 7 and 5 were not much in demand. The still larger beads were called scatter beads [*Streuperlen*]...." Ballotini were used for gluing onto walls in bars, for beaded cinema projection screens, for street signs, and even picture postcards. Scatter beads were used for children's toys and restaurants used them to clean their tin beer pipes (Breit 1987-1990:71, 72).

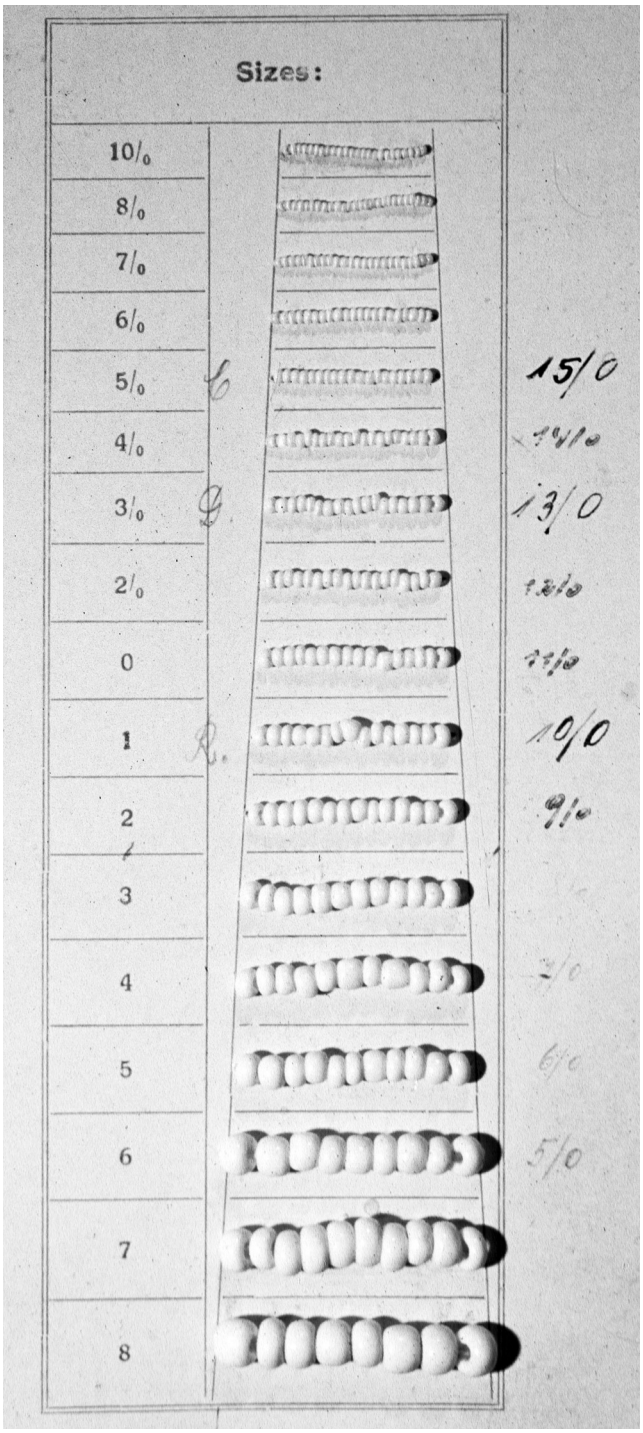


Figure 23. Rocailles, art. no. 1004, probably Ludwig Breit, Swäbisch-Gmünd, before 1957 (original size) (Dr. Klaus Breit, Schwäbisch-Gmünd).

Numbering Systems in Other Fields

The system of numbers and zeroes was also common in other fields, above all for measuring the gradations of fineness in wire. Systems and measuring instruments (Figure 31) were not uniform, but could vary according to material (metal), country, and factory. Sometimes the thickest wire had the smallest number; at other times the finest wire had the lowest number. In a third method, the

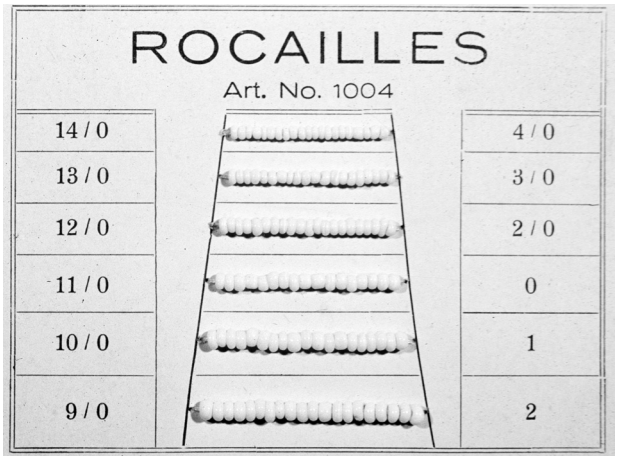


Figure 24. Rocailles, art. no. 1004, Nos. 14/0-9/0, 4/0-2, sample card without company name, probably Ludwig Breit, Schwäbisch-Gmünd, before 1957 (original size)(Dr. Klaus Breit, Schwäbisch-Gmünd).

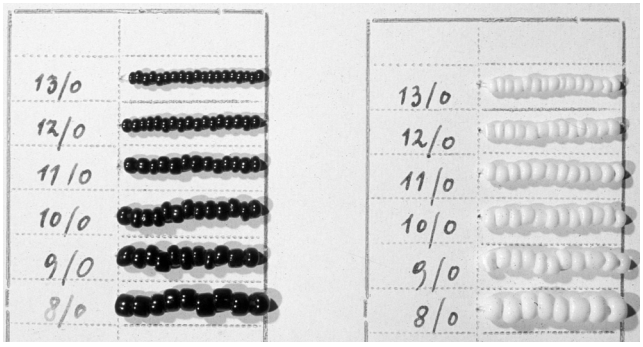


Figure 25. Rocailles, no. 13/0-8/0, no company name, probably Ludwig Breit, before 1957 (original size)(Dr. Klaus Breit, Schwäbisch-Gmünd).

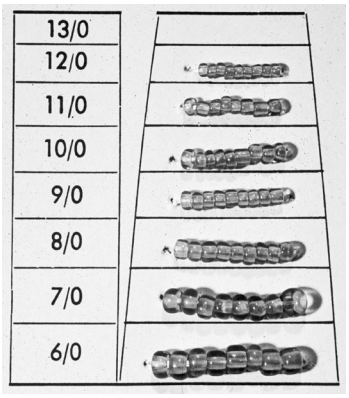


Figure 26. Rocailles, art. no. 1004, nos. 13/0-6/0, original size; no company name, probably Ludwig Breit, Wiesenthalhütte, Schwäbisch-Gmünd, after 1957 (Dr. Klaus Breit, Schwäbisch-Gmünd).

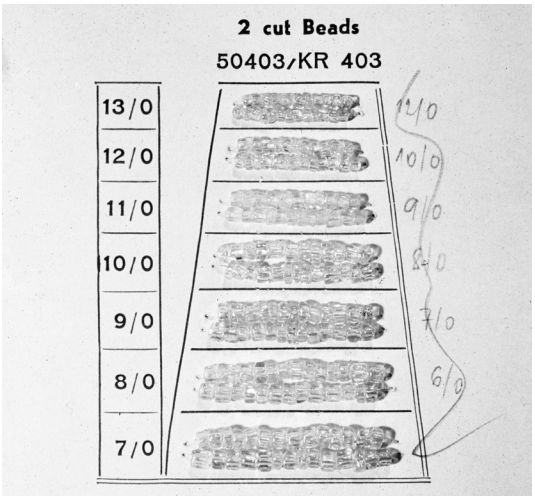


Figure 27. Two-cut faceted beads, no. 50403/KR 403, nos. 13/0-7/0, detail of a card without company name, probably after 1950 (original size)(Dr. Klaus Breit, Schwäbisch-Gmünd).

medium sort was indicated by the smallest number (1) and then counted upwards and downwards. When a series of numbers began with 1, a certain number of zeroes was added to it, a procedure we already know from measuring glass beads (Prechtl 1833, 4:144, 145). "The wire is differentiated according to numbers," writes Keess. "The tinsel wires [*Flitterndrähte*] go, for example, from nos. 1 to 10, or even 12, the sizes used for horse bridles up to 16, the "plash" [*Plashdrähte*] wires from nos. 1 to 6, the bullion wires from nos. 6 to 9, the "tirage" [*Tiragedrähte*] wires from nos. 7 to 8, the fine wires for lace, spun objects, etc., up to nos. 9, 10, and 10 ½" (Keess 1823:457).

A piece of metal called a "wire measure, wire handle, or wire gauge" had "notches or holes of different width, corresponding to the diameters of different kinds or numbers of wire. Every incision is labeled with the number that belongs to it" (Prechtl 1833, 4:149). Despite the inaccuracies that resulted in using them, these devices for measuring wire were held on to because they were easy to use. Prechtl sketches the devices that had the same number of holes as the assortment numbers (Figure 31). He also mentions the wire gauge of the Englishman, Robison, which gave measurements of the wire in hundredths of an inch (Prechtl 1833, 4:149-151). Watch springs were also measured with a spring measuring device, a sheet of brass with notches on the edge of different widths that corresponded to the numbers (Prechtl 1834, 5:526). Every spring factory had its own special assortment; the spring gauge from Carrisot in Geneva had 47 numbers, from the narrowest (no. 1 = slightly more than ½ line) to the widest (no. 47 = 2 ¾ lines). The difference between the

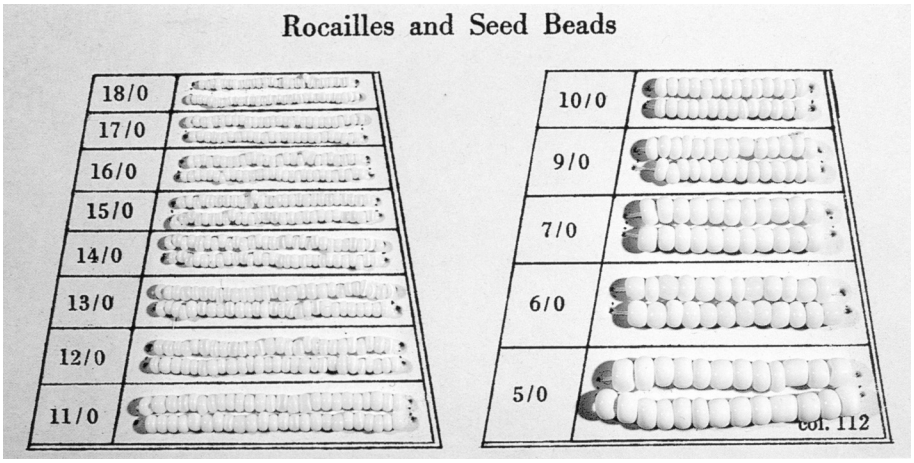


Figure 28. Rocailles and Seed Beads, nos. 18/0-9/0 and 7/0-5/0, "Czechoslovak Glass Export Co. Ltd., Section Beads," Jablonec, after 1945 (original size)(Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

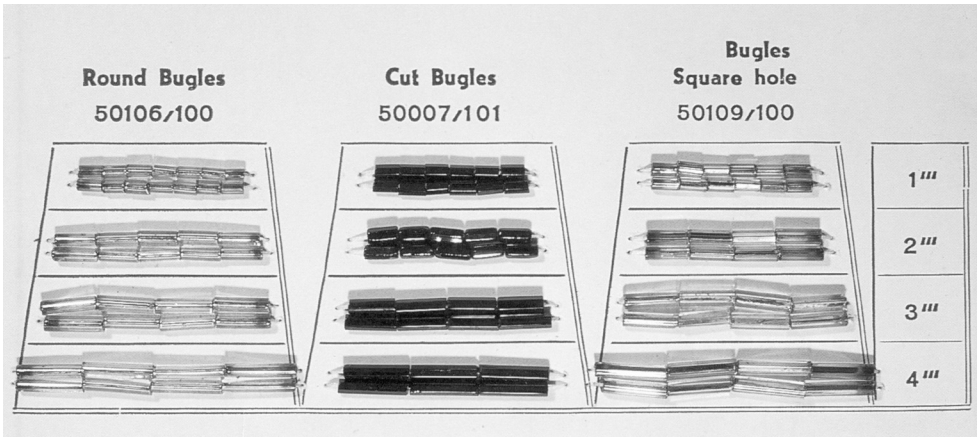


Figure 29. Bugle beads ("Round Bugles, Cut Bugles, Bugles - Square hole"), nos. 1"'-4,"' detail of a sample card without company name, probably after 1950 (original size)(Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

incisions was not quite 1/20 line. On a different Swiss spring-measuring device the difference was slightly more than 1/15 line. The finest gradations are seen on a spring gauge from Dutrambler in Geneva (nos. 1 to 34, with a difference of 1/23 line). Piano strings were also measured using numbers; the 31 types of Nuremberg piano strings started at 9 ½ null as the largest type, running to 7 as the smallest. In Vienna there were 17 types, from the number 8 null to 9 (again the smallest!) (Harzer 1851:109). The finest gradations of gold and silver wire were also identified by numbers: no. 1 was the smallest, no. 11 usually the largest. Half-steps were also possible; the silver-plated wire or "Paternoster wire" ranged from nos. 0 to 14, drawn silver from nos. 0 to 8, heavy wire from nos. 0 to 12, and drawn brass from nos. 0 to 8 (Harzer 1851:134). The length and thickness of pins were also measured using numbers (Harzer 1851:197), and sieves were also sorted according to numbers (Harzer 1851:350-352). From the material presented here, it is easy to see that although number systems – including some with multiple zeroes – were common, they were anything but uniform or universal. Bead gauges must have deviated from one another, too, as the variations shown on the Unger cards of faceted beads and blown beads prove.

Bundles, Bunches, Threads, and Strings

The commercial units for beads (quantity or weight) were determined by various criteria, but chiefly by their

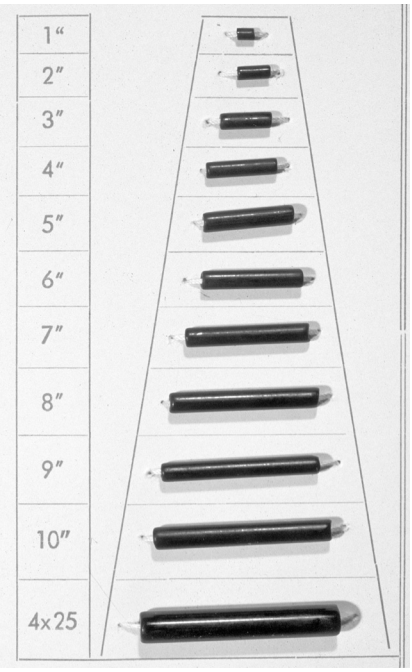


Figure 30. Bugle beads, art. no. 1012, 1"-10" and 4x25, Ludwig Breit Wiesenthalhütte, Schwäbisch-Gmünd, after 1957 (Dr. Klaus Breit, Schwäbisch-Gmünd).

size or their value. Keess (1823:899) gives the pound as the weight unit for two types of Venetian beads. Sizes, too, were differentiated: *collane* (*margherite*) and *conterie* (½-, 3-, 4-, and 5-pound units). The differences in bead weights depended on the metal content: the yellows were the heaviest (1 bunch with 10 strings = 95 grains), the pale blues the lightest (55 grains) (Altmütter 1841:92).

Real pearls were often sorted according to weight: the pearl measuring device was a thin piece of brass with round holes "of different, gradually decreasing sizes; they were shaped so that, for instance, one hole would pass a pearl of exactly ¼ carat, the next one a pearl of ½, then from ¾, 1, 1¼, 1½ carat, etc..." (Altmütter 1841:73). There is frequent mention of pound beads in the crafts publications of the Historicism period.

Generally speaking, beads characterized neither by unusual size nor value were sold by the bundle (1 bundle = 2 bunches, 1 bunch = 12 strings, 1 string = 50 beads) which contained 100 dozen beads (1,200 beads) (Tayenthal 1900:24; Winter 1900:20; Zenkner 1983:110). Depending on regional practices, expressions could also vary; we sometimes find the terms thread (*Fäden*) and string (*Schnüre*) interchanged. The bundle (1,200 beads) was already common as a pricing or sales unit during the Biedermeier period (Prague 1833:58, no. 1288). The unusual size of some beads, their value or a particular customer preference were often the reason for a kind of stringing that differed from the usual norm of the bundle. Schander provides the following details for the expensive real gold beads:

> Strings of 25 or 50 beads, or the well-known 38 cm length, or the also well-known string of pear-drop beads holding 15 beads with each side ending in an end-drop. According to regulation, 10 or 12 or 15 strings are then bound together, that means both ends are tied off and that is 1 bunch. Again, the gold beads are an exception; whereas the bunch of silvered beads is now ready, the gold bead bunch is tied at both ends with braid-silk, usually green" (Schander n.d.:9).

So far I have found the bunch used much more often than the bundle as a commercial unit in contemporary (*Bazar*) and other sources. We do not know with any certainty how many beads were contained in these bunches, since the bunch can sometimes hold differing numbers of beads: at the Munich Industrial Exhibition in 1854, Fischer's bunch (*Masch*) held 1,200 beads while Hermann's bunch (*Masche*) of larger beads contained 100 pieces; for smaller beads, the amount was 1,000 per 1 bunch (Munich 1855:47).

Venice and Murano

The following figures have been handed down for the small strung Venetian beads. With differences depending on size and weight, one bundle (a *mazza*) contains 12 bunches, each bunch contains 10 strings or strands (1 bundle = 120 strings). A bundle could therefore contain up to 22,000 beads (Altmütter 1841:92). Contemporary information is frequently very general. This is also true of Bussolin who points to bundles ("masses") of various dimensions depending on the quality and size of the beads, and mentions that the embroidery beads are strung into bundles of 120 strings, each of which is 5 inches long (*les margaritines à broder sont enfilées en masses de cent et vingt fils de cinq pouces de longueur*)(Bussolin 1847:25).

Zanetti only mentions bundles; these consist of varying numbers of strings depending on the type of items and whether they are longer or shorter (*...donne e piccole ragazze... facentone matasse, mazzi, dozzine composte di più o meno fili più o meno lunghi secondo il genere della merce e le ordinazioni*) (Zanetti 1874:131, 132).

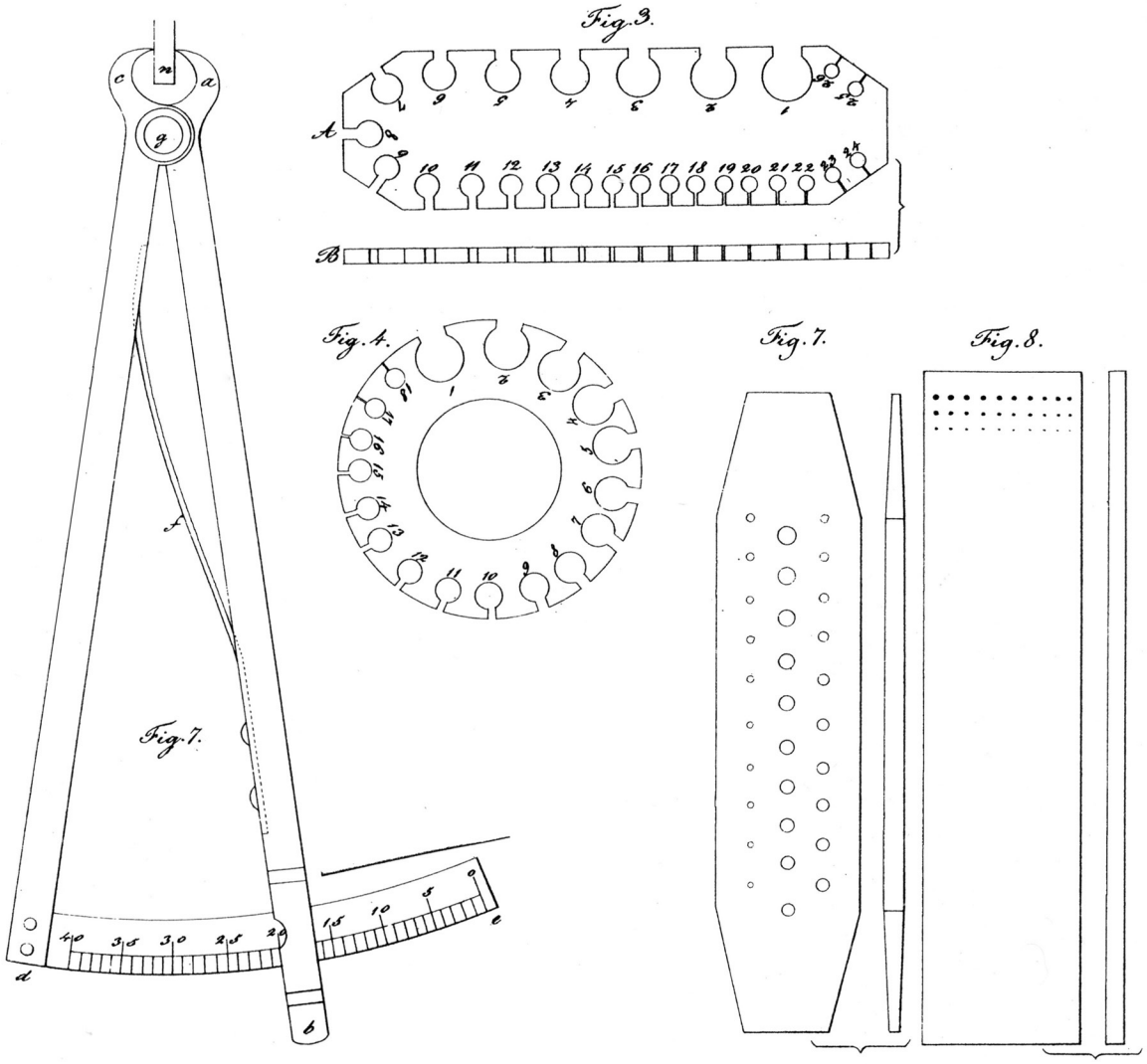


Figure 31. Measuring instruments (Prechtl 1834, 3: Plates 65, 66).

BEAD PRICES

The prices of glass beads, subjected to drastically changing fashions, popular taste, the introduction of tools and machines and other factors, can only be given here in examples. There is naturally more information available to us from the late 19th century than from the beginning. Here, too, we are limited to the few sources that were published.

Venetian Beads

In 1819, the small Venetian beads or *collane* cost "for a dozen strings, depending on the difference in color, from 30 centesimi to 2 ½ Ital. lire; the scarlet red ones are the most expensive" (Keess 1823:899).

One important factor that determined bead prices was their color; the cheapest were the black beads (4 ½ kreuzer assimilated coinage), the dark brilliant reds the most expensive (23 kreuzer) (Altmütter 1841:92).

Bohemian Beads

The prices for Bohemian Biedermeier beads were listed by the 100 dozen (1,200 pieces, in general, = 1 bundle). Prices for drop earrings and pear ear-drops were by the gross (12 dozen = 144 pieces). In rare cases prices for special strings were listed separately.

"Bohemian stones" were produced every year to a value of 20,000 fl. (Schreyer 1799:309). One must, however, take into account that the price for "composition stones has been brought down by 400 percent in the last 40 years" (Schreyer 1799:311). The following are the prices per 100 dozen composition stones: large – 7 fl. 30 kr., medium – 3 fl. 45 kr., smaller – 4 fl. 30 kr. Stones for buckles brought per 100 dozen: 3 fl. 45 kr. (no. 1) to 3 fl. (no. 4). The crimson-red stones sold for between 2 fl. 45 kr. (no. 1) and 1 fl. 30 kr (no. 6) per 100 dozen. The ruby-red stones were even more expensive because of the gold that was used.

Karl Joseph Zenker (Zenkner) of Josephsthal exhibited a large number of beads in Prague in 1829. Their quantities were listed in strings, their prices per hundred dozen. This is confusing but probably meant that the number of strings (at 50 beads each) was the quantity that was exhibited; the prices listed for a hundred dozen, however, correspond with common practice (Prague 1831:9):

> Twelve strings pink cut beads. Hundred dozen, from 52 kr. to 4 fl. 45 kr.
>
> Twelve strings fine cut beads. Hundred dozen, from 1 fl. 40 kr. to 5 fl. 40 kr.
>
> Twelve strings garnet-colored cut beads. Hundred dozen, from 57 kr. to 4 fl. 55 kr.
>
> Twelve strings garnet-colored cut beads. Hundred dozen, from 1 fl. to 4 fl. 10 kr.
>
> Seven strings small wound spools. Hundred dozen at 45 kr.
>
> Seven strings small wound beads. Hundred dozen at 45 kr.
>
> Seven strings medium wound beads. Hundred dozen at 12 fl. 30 kr.
>
> Seven strings small striped beads. Hundred dozen at 1 fl.
>
> Seven strings medium striped beads. Hundred dozen at 1 fl.
>
> Six strings silvered beads. Hundred dozen at 45 kr.
>
> Twelve strings mottled [*genarbte*] beads. Hundred dozen at 5 fl.
>
> Garnet-ruby beads. Hundred dozen at 50 kr.
>
> Coral beads. Hundred dozen at 1 fl. 30 kr.
>
> Garnet laurel berries. Hundred dozen at 45 kr. to 51 kr.

Unfortunately, Zenker (Zenkner) was the only one who gave the prices for the different types of beads separately; Göble from Gablonz listed a total value of 200 fl. for a box with 202 strings of beads (Prague 1831:40), and the prices given by Ferdinand Unger & Co. of Liebenau refer to the sample cards which range from 30 to 50 fl. (Prague 1831:74).

In the catalogue of the Prague Exhibition of 1831 (Prague 1833:58, 59), a relatively broad range in price is sometimes shown for some of the different kinds of beads from the Glass Composition Factory of the Zenker Brothers, Karl and Franz, in Josephsthal (always listed for 100 dozen):

> Pink cut beads: 48 kr. to 4 fl. 40 kr.
>
> Ruby-red cut beads: 48 kr. to 4 fl. 40 kr.
>
> Garnet-colored beads: 53 kr. to 4 fl. 50 kr.
>
> Fine cut carnelian beads: 1 fl. 40 kr. to 5 fl. 40 kr.
>
> Ordinary cut carnelian beads: 1 fl. to 4 fl. 10 kr.
>
> Wound beads: 36 kr. (small), 1 fl. 30 kr. (medium), 3 fl. (large)
>
> Wound spool beads: 45 kr.
>
> Striped beads: 1 fl. 30 kr. (small), 2 fl. (large)
>
> Mottled or patterned beads: 3 fl.
>
> Lined ruby beads: 1 fl.
>
> Coral beads: 1 fl. 30 kr.
>
> Olive beads: 40 kr.
>
> Ruby-colored beads: 40 kr.
>
> Whorled beads: 3 fl.
>
> Glass beads: 24 kr. to 30 kr.
>
> Silvered beads: 12 kr. to 40 kr.

A "string of gold-topaz composition beads" was listed at the astonishingly high price of 7 fl. Particularly during the last third of the 19th century, a drop in prices came about due to the introduction of certain tools, gang molds, machines, and finishing processes in the Gablonz area. For blown beads these were the metal molds; for drawn beads they were the machines that snapped off the beads (*Sprengmaschinen*):

> The introduction of the machines for snapping off the beads, a single one of which is capable of replacing several hundred people, has increased bead production enormously and this in turn has exerted an enormous effect on the entire situation.

> Articles which were difficult to buy at a price of 5 fl. in 1886, are easily had today for 80 kr. Cut-glass beads made today are more beautiful and more uniform than 10 years ago; back then 10 bundles (1 bundle = 1,000 beads [sic! correct: 1,200 beads]) cost 80 kr. to 1 fl.; today the same amount costs 8-9 kr. .... [Blown beads] Towards the end of the 70s, molds were invented by one producer which could make 10-12 beads at a time instead of just one bead. This was kept secret for a while, but soon became noticeable in a 10-15% drop in prices.... Before the invention of these molds, a no. 0, silvered bead cost 60-80 kr. per 100 dozen, today the same costs 20-22 kr. Repeated attempts to fix minimal prices or wages had no success whatever, since as soon as a single bead blower broke such an agreement, it led to a downward push in prices and wages along the entire line (Gablonz 1897:79-81).

The prices for Bohemian imitation stones (*Similisteine*) were also subject to fluctuations: "The prices for finer types, which had climbed from 5 fl. 50 kr. to 8 fl. 50 kr., gradually began to drop and towards the end of the year 1896, stood at 6 fl. to 6. fl. 25 kr. again" (Gablonz 1897:83).

According to Winter, at the end of the 1850s and the beginning of the 1860s, a bundle of blown beads (blown freehand or in molds) brought a price of one guilder per bundle (1,200 pieces). After the invention of a mold that made it possible to blow a whole row of beads at once, prices sank. By the end of the 1880s, 40 to 45 kreuzer per bundle was reached. Since prices sank further and caused strikes as a result, the price for the 0-bead was set at 28 kr. per 100 dozen. Since this agreement was soon violated, a new strike was called in 1894-1895 and the price fixed at 22 kr. per 100 dozen, a price that held until 1897. The Production Cooperative of Blown-Glass-Bead Producers (*Produktivgenossenschaft der Hohlperlenerzeuger*) was founded in 1898 (Winter 1900:69).

> Even the rocaille used to be a well-paying article which could bring in a profit. Today things are different. Formerly, 1 fl. was paid for the kilogram. Now, if the refiner gets 25 kr. for the same amount, it is enough. The waste products from the silver, that account for 2 percent of the turnover, used to be thrown out with the dirty water; today the waters are recycled and the seed-bead producers get 30 to 35 percent of the silver back again. 25 years ago, 10 bundles of 3-cut rocaille cost 2 fl., 15 years ago 1 fl., 7 or 8 years ago they still cost 60 to 80 kr., and now, since the snapping machine increases production, 10 bundles are sold for 6 ½ to 8 ½ kr. (Winter 1900:97).

Price lists of the Ludwig Breit Wiesenthalhütte glassworks in Schwäbisch-Gmünd throw light on the post-war years (1963); the prices were valid "for loose rocailles in large amounts" (art. no. 1004) from Schwäbisch-Gmünd. The prices were set according to color and size; the cheapest colors were crystal and black; the most expensive were, among others, opaque yellow, opaque orange, coral, opaque brown, opaque pink, and ivory. A few figures for comparison: per kilogram, crystal rocailles cost from DM 12.10 (size 14/0 or 4/0) up to DM 8.50 (size 8/0 or 3). Coral-colored rocailles were set at DM 20.10 (size 14/0 or 4/0) to DM 14.30 (8/0 or 3).

GLASS, COMPOSITION, RODS, TUBES, AND CANES

When "Glass and Composition Buttons" are listed on a sample card from Ferdinand Unger of Liebenau (TH 32848, prior to 1837) with the intention of making a distinction between the two, it refers to the different raw materials. Contemporary sources repeatedly mention the terms glass, glass composition, or composition. Usually glass and "composition" are treated as opposites. But "composition" is also glass, albeit glass of a specific composition: it contains lead and easily fusible substances; i.e., substances that melt at a lower temperature than those in other types of glass. The differentiation between "composition" (sometimes one finds the term "Venetian flux") and glass is as common in other languages as it is in German: in Italian we find *vetro* and *smalto*, in French *verre* and *émail*, and in English "glass" and "paste."

The history of Gablonz glass is inseparably connected with composition, the easily fusible leaded glass with colors resembling precious stones: one reads about chrysolite and chrysoprase beads, about beads named for garnets and rubies, sapphires and aquamarines, amber and amethysts, topaz and turquoise, and about coral and crystal. The Turnau gem-cutting industry found itself in a crisis: the "fake" gemstones had pushed the real ones aside (Hallwich 1873:6) and every effort possible was made to discover how to make the Venetian "glass paste" used for producing glass stones. Venetian paste was in demand everywhere. Keess (1823:904) reports that Viennese bead factories started out using the Venetian glass "which was brought here in flat round loaves and afterward was drawn into tubes;" later they mostly used Bohemian glass tubes. The "raw cakes of glass paste" from Venice were even supposed to have been sent to Bohemia "where they were frequently remelted, remixed with harder crystal glass, and used for beads and imitation gem stones" (Altmütter 1841:106, 107). Venetian "glass cakes" from that time still exist today – flat and round or

as broken chunks of such "loaves" in little cylindrical jars (Plate 20D top) in the collection of the Technical Museum of Vienna (Neuwirth 1993:51).

The beginnings of Bohemian "composition" lie in obscurity; the clues become lost in the 17th century. According to Zuman (1929:54), one can definitely assume that in the second half of the 17th century, "the production of false stones in the Italian manner was widespread in Turnau and its environs." The often-repeated story of the Fischer brothers from Turnau sounds like a legend. They were supposed to have worked as journeymen in Venice for five years "without divulging where they came from" (Benda 1877:276). After returning to their homeland, their first attempts failed, but finally in 1711 they made "the first composition of pulverized gravel, saltpeter, and minium." The "Bohemian diamonds," as the composition stones were called, were sold in enormous amounts. The "composition" got to Gablonz – according to a number of concurrent reports – by way of the *Old May*, a freighter that brought the bowls and jugs from Naumburg (Silesia) to the Turnau furnaces. Turnau melted mostly the ruby and garnet colors which were considered the best for a long time. Other composition glassworks were established in Wiesenthal, Liebenau, Josefsthal (Lilie 1895:162, 163), and Kukan (Zuman 1929:57). In Morchenstern there was a glass-composition factory, eight composition furnaces, fourteen glass or composition mold-pressers, and 40 bead blowers, along with 1,580 cutters who mostly cut glass corals and chandelier stones in addition to hollow glassware, and finally, 270 bead stringers (Zuman 1929:57). Important statistical data on composition production are handed down to us from the year 1827 (Neumann p. 39, after Zuman 1929:57, 58):

> In the year 1827, in the dominions of Morchenstern and Kleinskal, in the cities of Turnau, Liebenau and environs, in Semil, Rohozec, Grosskal, Svijan, there were 68 glass and composition mold-pressers, 2,064 glass and composition cutters, eleven composition burners working in composition production, and in the composition glassworks some 1,066 cwt of raw material were produced which were accounted for as follows: from the city of Turnau 456 cwt, from the market of Gablonz 250 cwt, also 250 cwt from the area of the dominion of Morchenstern, from the city of Liebenau 70 cwt, and from the dominion of Rohozec 40 cwt. In the Glasshouses of Antoniwald, Christianstal, and Tiefenbach, the amount produced in that same year was: 1,090 cwt of pressing rods and 1,020 cwt of chandelier stones, of which Antoniwald produced 600 cwt pressing rods and 400 cwt chandelier stones; Tiefenbach, 90 cwt pressing rods and 220 cwt chandelier stones. The value of the turnover amounted to 458,312 fl. 39 kr. in assimilated coinage; the workers' wages amounted to 137,510 fl. in assimilated coinage.

One of the oldest printed sources describing the production of Bohemian "composition" is Schreyer's handbook on "Commerce, Factories, and Manufactories of the Kingdom of Bohemia" (*Kommerz, Fabriken und Manufakturen des Königreichs Böheim*) from the year 1790. According to Schreyer, the "Bohemian composition stones" were made in the following manner:

> The composition these stones are made of consists of gravel pulverized to dust, minium, and saltpeter; the well mixed mass is placed in a melting crucible with a mouth that is narrow like a jug; the lid placed upon it is smeared with clay, it is put into a kiln for 24 hours at constant heat and made to melt. When the fire is put out, the crucibles are left in place until the whole kiln is cooled off, then taken out, the clay around the mouth knocked off and the composition removed and stored for further use and for finishing Bohemian composition stones.... Instead of saltpeter, borax was also used to give the composition paste greater hardness (Schreyer 1790:92).

On 7 July 1835, a privilege was granted to Joseph Jäckel and Sons, "Composition Stone Maker of Neudorf in the Bunzlau District of Bohemia... for the invention of a paste named: Venetian Paste for making all kinds of stones and beads for jewelry and ornament work;" it expired already in 1836 because of "deficiencies in the description:"

> The patentee prepares the above mentioned paste in a double draught furnace from a mixture of potash, rock crystal, minium, saltpeter, burned bones and such, in unspecified amounts. – For coloring he uses, according to the demands of each particular time: mountain blue, chrome yellow, gold oxide, manganese dioxide, etc. (Patents 1842, 2:230).

In 1854, an address book names Pfeiffer & Co. as the owner of a paste, enamel, and glass factory (Gottfried-Pernold 1854, 2:78); in the environs of Gablonz, the Weiss Brothers of Neudorf ("glass composition beads") are named, also Anton Zappe with "composition glass beads" (Gottfried and Pernold 1854:79). Of course, the composition-glass producers named here can also be taken as being representative of many others; Lilie (1895:162) lists the centers towards the end of the 19th century as Gablonz, Albrechtsdorf, and Josefsthal.

Rods, Canes, and Tubes

The raw material for making beads is glass of differing composition and shape: the semi-finished products used

were rods (solid) or tubes (hollow) and canes (solid or hollow). Canes from Murano and Venice, chiefly filigree and network (*reticello*) glass (Plates 8C, 9A-9D), are represented in the collection of the Technical Museum in Vienna along with tubes and canes of unknown provenance in little cylindrical jars (Plate 20D top); Bohemian "canes for making pressed buttons" are not lacking either (Plate 8D) and from the Hessen glasshouse in Oberursel there is the lovely collection in Neugablonz (Plate 7D).

The Drawing of Tubes, Rods, and Canes

Being able to draw rods by machine in the 20th century was preceded by various techniques which involved the large glass houses along with lamp blowers and composition glassworkers. According to Breit (n.d.a:1), drawing was done by hand at the time, with the help of pedal-driven bicycles on tracks and later with electrically powered wagons or by the Danner process.

At the flame of the oil or tallow lamp (later a gas burner), the beadmaker drew out fine tubes (Loysel 1818:304). According to Graeger (1868:118), drawing glass tubes at the glassblower's lamp took place over a little coal pan or at a drawing bench. The length of these tubes depended on the technique used: the shortest were those made at the flame; the longest, those made in the drawing gallery. At the drawing bench, rods were made that had a 25-35 mm diameter and a length of 0.15 m to 1.20 m (*Sprechsaal* 1892:1004). The drawing lanes had a length of up to 150 m;[2] here, too, long canes and tubes of different lengths were made. For "glass spinner" (lampblower) work, thin hollow tubes were produced which had a diameter of 3-8 mm and often a length of 20-25 m. These were divided into uniform pieces with a length of 0.60 m each (*Sprechsaal* 1892:1004). In the drawing works or the "gallery," tubes up to 150 m in length were made (Benrath 1875:349).[2] Winter (1900:9, 10) gives a very descriptive account of how tubes were drawn at the Riedel glasshouse around the turn of the century. He must have found the assortment of canes and rods particularly impressive:

> The lay person would be overwhelmed by such variety. Hollow canes from a line [2.25 mm] up to one centimeter in diameter, rods from this width up to an inch in thickness and each rod and cane in all the standard colors and each color in 40, even 50 shades, also the separation into pale (transparent and translucent) and opaque colors, like turquoise, Japan yellow, carnelian – all of this can be seen here in the three storeys of the storehouse. In the lowest storey we are faced with a forest of glass canes. Each of them is about 2 meters high; groups of 10 to 15 of them are always tied up in 20 kilogram bundles with straw, and bundle after bundle line the stands they are leaned against; color after color. Here is ruby, there translucent crystal; here emerald and there imitation amber, then again crystal canes overlaid with delicate colors, there aquamarine and amethyst, in short a color concert which could not be more beautiful or richer in the imagination. In the low-ceilinged smoky pressing houses, all these canes are worked up into every possible kind of practical and luxury article imaginable, namely into chandelier pendants, buttons, buckles, and all sorts of ladies' jewelry (Winter 1900:7).

Drawing glass tubes is a process in the art of glassblowing that was known long before the existence of the first Gablonz tubes and canes for making beads. In the Riedel glasshouse, the first drawn beads were supposed to have been made in 1793, the first rods in 1803, and the first "bead glasses" for making blown beads in 1815 (Arnold 1909:92; Tayenthal 1900:4). According to Parkert (1925:135, 136), Elias Zenkner was already making hollow glass tubes in 1700. Working them over a pointed jet flame in a very primitive way, he made them into beads in a glasshouse especially built for this purpose, using a number of outside glassworkers.

The oldest account of drawing canes known to me is the one in the section, *Verrerie*, in the *Encyclopédie* by Diderot and d'Alembert (1772) (Figure 32). Air is blown into a glass gather, another little gather is attached to it and two workers draw out the gather above wooden boards laid out crosswise. The tubes are divided into uniform lengths with the help of a flint (*pierre à fusil*) and tied into bundles. These illustrations have been utilized in a simplified version in 19th-century literature on glass technology. We have descriptions of how rods were drawn, starting from the late 18th century: the Wenzel brothers and Franz Fischer in Turnau had "invented a different way, namely to draw the composition in a draught furnace into canes, thick and thin, the way they were needed..." (Schreyer 1790:93).

In 1823, Keess reported on the technique used in Murano and Venice:

> A worker sticks an iron rod into the red-hot glass material, rounds off the blob of glass hanging to it on a round piece of iron and pierces a hole through it. A second worker attaches a similar glass blob to it and both run away from each other for at least 100 paces, whereby the glass material shapes into perforated rods. During cooling the rods break off by themselves or are broken off in pieces the length of a shoe so they can be delivered to the bead

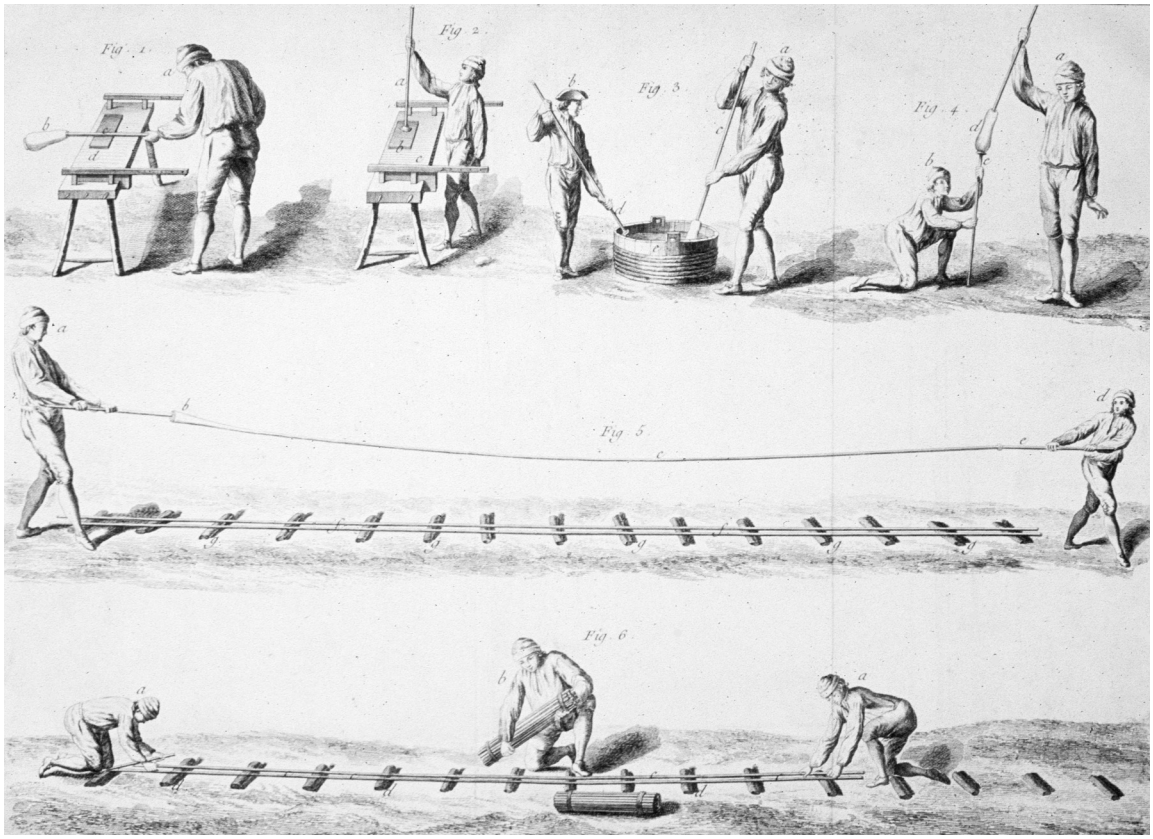


Figure 32. Drawing glass tubes: *Verrerie en bois, Différentes Opérations pour filer les Tubes des Barometres, pour les couper &c. &c.* (Diderot and d'Alembert 1772, 10: Plate XXI).

> factories in Venice more comfortably.... Colored canes for other purposes, e.g., baskets, do not get a hole (Keess 1823:899, 900).

Kreutzberg devotes a separate paragraph to "Glass compositions, beads, squeezed and blown glass." It claims that some 10,000 people worked in this branch of production which made a profit of 2,000,000 florins.

> The main center of trade in glass corals, drawn beads, and chandelier stones is the market town of Gablonz.... The production is generally run by local entrepreneurs who supply the workers scattered throughout the neighboring dominions of Morchenstern and Kleinskall with samples and materials. The first group is divided into composition burners who melt the glass into the various colors and shades, and then shape them into rods and tubes (Kreutzberg 1836:26).

At the glass factory of F. Unger & Co. in Dunkelthal near Marschendorf, first place in the production line (ca. 1860) was held by "raw glass in rods for the fabrication of pressed beads, buttons, stones, etc., etc." and "hollow glass canes for the fabrication of various kinds of beads, etc., etc." In Tiefenbach, the company also owned a "factory... with glass refineries for prisms, beads, buttons, stones, bijouterie articles, etc., etc., at which 224 plain cutters, 60 hollow cutters, and 40 bead cutters and almost 500 outside workers in the surrounding area were employed in the company's own cutting works..." (Anschiringer n.d.:99, 100). Special attention was given to the fact that F. Unger & Co. was the only company at that time "which produced, decorated, and marketed every single glass article in its own factories" (with the exception of tablewares and mirror glass).

The hollow space required for the bead perforation was created during the drawing of the tube, either by blowing air into it or by pressing a metal cylinder lengthwise into the center of the glass cylinder. In the beginning, the perforations had a round cross-section; later they could also have square, triangular, or wide (for stringing on ribbons) shapes. On a sample card from the company "Czechoslovak Glass Export Co. Ltd., Section Beads" in Gablonz, the type of perforation is indicated for every bugle ("square hole bugles, round hole bugles"). The cross-sections of tubes and rods were also round in the beginning; the invention of angular

glass rods is associated with the Tiefenbach glasshouse in 1803 (Vienna 1845). A number of privileges are devoted to the further development of angular glass rods and tubes. The polygonal walls could either be made straight or curved.

Two privileges from 1864 have survived which are not concerned with the round cross-sections of drawn rods or tubes, but protect the production of angular rods with flat or concave curved walls, an innovation at the time. Giuseppe Bassano describes the "*fabbricazione della canna di Vetro e Smalti, scannellata, angolare e a rosetta*" (Figure 33), and Giuseppe Zecchin provides the "*Descrizione d'un nuovo metodo per la fabbricazione delle Canne bucate di vetro a vari colori ad uso Conterie ed in pezzeti infilati di forma angolare prismatica a varie faccie piane o concave*" (Figure 34).

Benrath describes the drawing of tubes exactly: after shaping a short solid cylinder on the marble plate, the worker uses a short iron rod with a rounded end to press a cylindrical perforation into the lengthwise axis of the glass cylinder. The opening is closed off with hot glass and two tube-drawers pull the glass along a gallery, about 120 to 150 meters long, built into the shed (Benrath 1875:349). A few years later, Benda goes into the process of drawing canes for making drawn beads (*Schmelzperlen*):

> ... at first the canes are drawn by wrapping a lump of glass weighing several pounds on an iron rod and working it, into this a hole is made with a compass-like iron tool coated with wax, and by rolling it constantly on an iron plate and repeatedly dipping it into water. Then on a second iron rod some glass is wound which one calls the rose. The rose is placed over the hole of the large glass gather (*Knaucke*) and now a boy runs down the gallery with the rod to which the rose is attached. At the same time the glassworker (drawer) keeps dropping the soft glass down from his iron rod, so that a glass rod many meters long and no thicker than a pin is formed. After the canes are divided, they are sorted exactly according to width and then the "cutters" take them over and, with a sharp iron (*der Schneidmaschine*), cut them into glass beads (a kind of breaking off) (Benda 1877:288, 289).

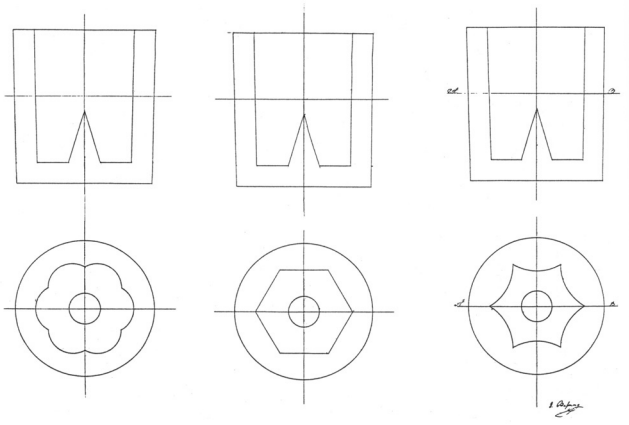


Figure 33. Privilege for making rods, 1864 (*Fabbricazione della Canna di Vetro e Smalti, scannellata, angolare e a rosetta*), J. Bassano, privilege no. 8396 (Austrian Patent Office, Vienna).

Riedel received a privilege in 1896 for a "device to draw molten glass into tubes and rods." This device relieved the drawer of the work almost entirely, since he now only had to cover a relatively short distance (5-8 meters), while the device could draw 60-70 meters (Figure 35).

Towards the end of the 19th century, we find the following situation:

> For the most part, it [the glass] is drawn into thick solid rods or thinner canes and delivered in this shape to the glass pressers and lampworkers; or it is made into hollow canes which the bead blower or the drawn beadmaker processes further. Also, large thin-walled spheres are blown in the glasshouses, separated into individual pieces with the diamond, cut, and taken over by the glass setters....
>
> Small glasshouses with a furnace at which the so-called composition, i.e., glass with a high lead content, is melted in clay pots (mostly 6, also 2 or even only one) and drawn into tubes and rods are called "composition glassworks." There are a number of them in the district, namely in Gablonz, Albrechtsdorf, Josefsthal. The thick solid rods are intended for the press-molders; the thin canes (hollow and solid), which are made here in all the colors imaginable, are intended for the lampworkers. Besides the standard colors, almost every composition glassworks has its own special colors which are not made by the others; how the single colors are melted, i.e., produced, is the secret and the art of those concerned... (Lilie 1895:162).

Around the turn of the 20th century, the assortment of glass rods being made achieved a variety that reached a highpoint in round and angular walls, but most of all, in the richness of subtle shades of color. This highpoint was taken even farther by different processing techniques (overlay, applied stripes, etc.). The German-Bohemian Exhibition in Reichenberg in 1906 provided a display of these achievements:

> The solid, opaque glass rods, which are displayed in long rows in all the gradations of colors, are intended for the further processing of solid glasswares. A different row of such glass rods has brilliant glass

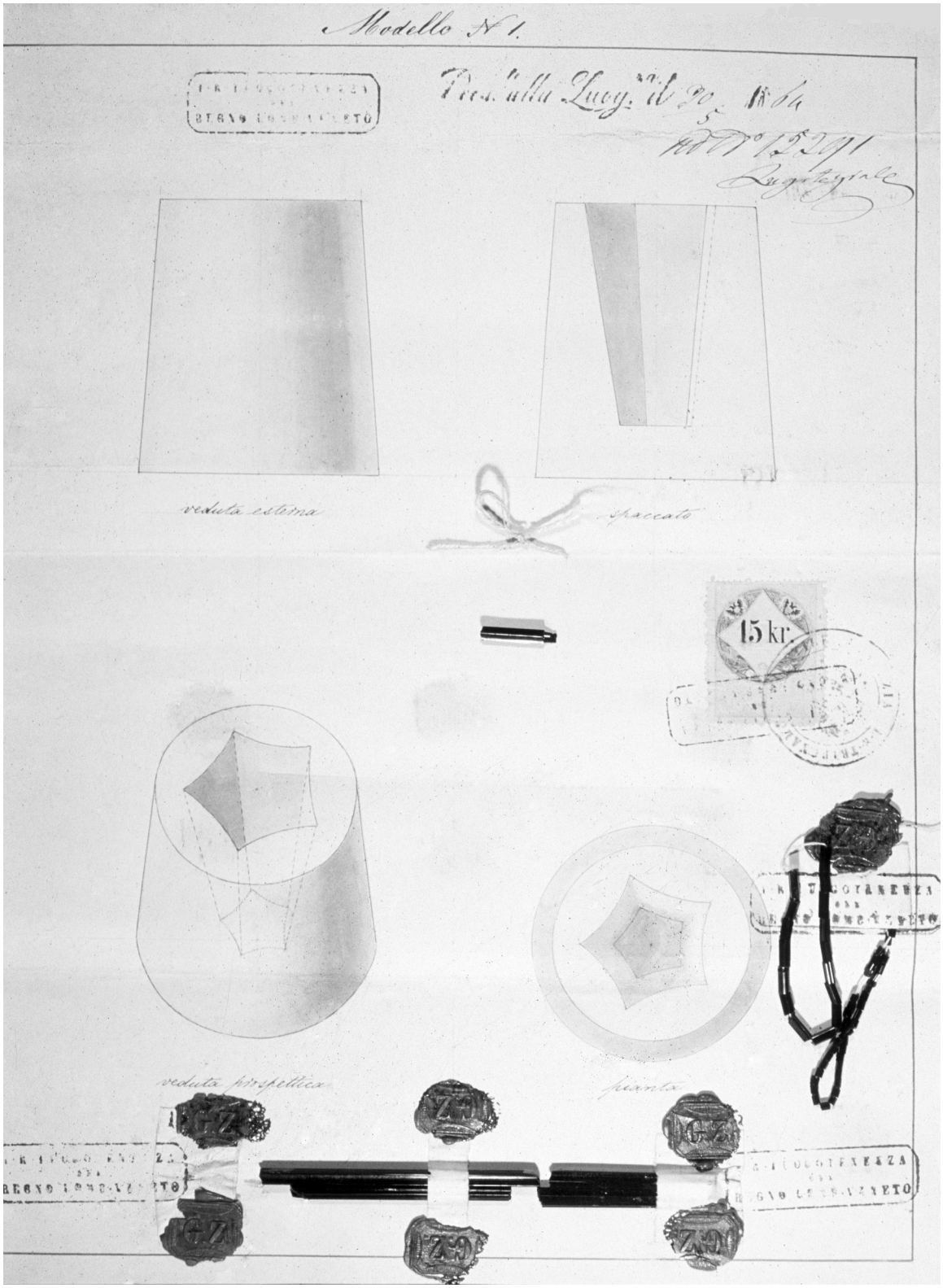


Figure 34. Privilege for making rods, 1867 (*Fabbricazione della Canna di Vetro angolare prismatico*), Giuseppe Zecchin, privilege no. 10280 (Austrian Patent Office, Vienna).

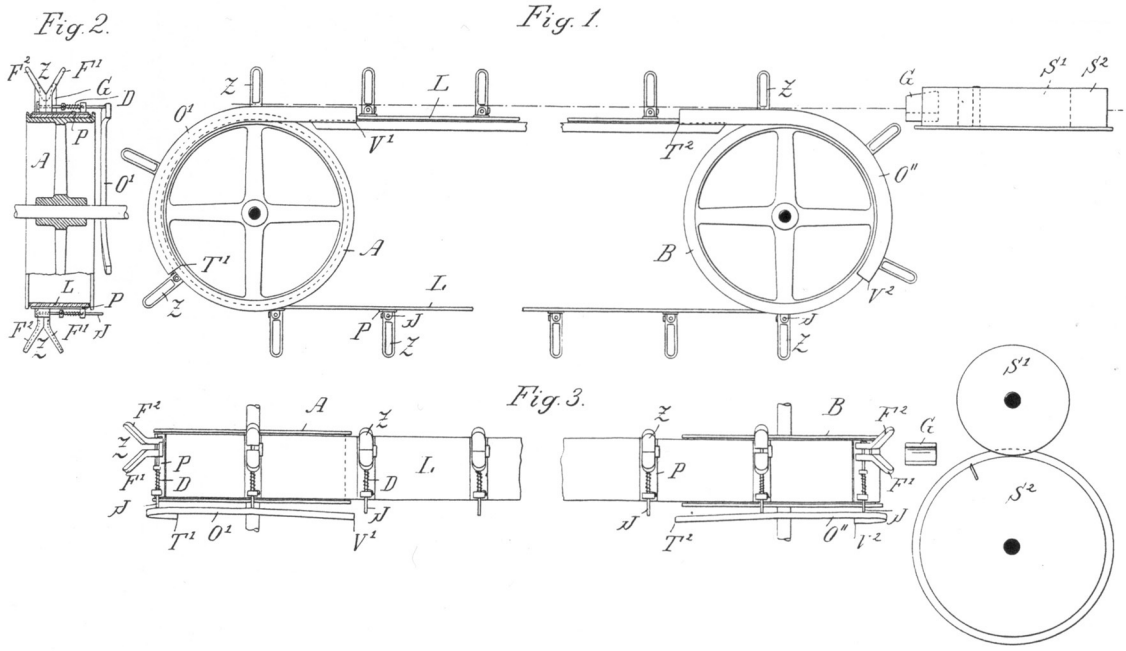


Figure 35. Device for drawing molten glass into tubes and rods, 1896, Josef Riedel, Polaun, previlege no. 46/2423 (Austrian Patent Office, Vienna).

> threads running though it, singly or repeatedly overlaid with glasses of a different color. This is the raw material which is handed over to contractors and made into glass buttons by them and their workers in many different ways. The thick tubes of glass in different colors and designs are used in the production of the important commercial product, glass rings... then again, we are confronted with an instructive collection of solid canes or thin tubes in transparent and opaque glass, which are used for further processing into blown, pressed, and drawn articles (Schindler 1906:1718, 1719).

According to Posselt (1907:12), the demand for glass rods "was covered into the 60s by Josef Riedel in Polaun, Karl Riedel in Christianstal, Franz Breit in Schatzlar, and Unger in Tiefenbach. The glass from the company of Jos. Riedel is better suited for seed beads, that from Breit better for cut beads (softer to cut)." Around 1930, six companies (L. Breit, Josef Priebsch, Ed. Redlhammer & Sons, Carl Riedel, Josef Riedel, and Leop. Riedel) were members of the Gablonz-Tannwald Group (the Glass Industrialists' Business Association and the Glass Industrialists' Workers Association). The most important sector of production was glass rods and canes. The importance of the raw glass which was supplied to the cottage industry mostly in the form of rods and canes, is described in more detail in the following advertisement:

> The main products of the glasshouses of the area, rod and cane glass, is supplied in a wide variety of combinations, widths, colors, and types. The color techniques, especially, are so well developed in the glasshouses that they can offer the cottage industry an almost infinite variety of the finest shades and subtleties, even in the different combinations of colors, such as overlays, stripes in opaque and transparent colors and in the purest crystal (Lodgmann and Stein 1930:378).

But other companies also supplied the industry. The composition glasshouse of Heinrich F. Hübner in Gablonz recommended: "Composition glass canes and rods in crystal, pink, ruby, and diverse transparent and opaque colors, mother-of-pearl and mother-of-pearl agates, 'saferin'" (Lodgmann and Stein 1930:414). A speciality was bracelets (bangles) made of glass canes whose incredible sales to India are reported in contemporary texts. They were mostly made from canes curled into cylinders (*Nappeln*) with basic patterns already in the walls and only had to be sectioned and processed. Without doubt, the invention of the coil rings (*Wickelringes*) by the Weiskopf Company in Morchenstern contributed a great deal to a rational production:

> In 1903, the company of Dr. Weiskopf registered a new article, the so-called "coil ring" for a patent.... The glass rod, at the same time it is being heated, is wound in a coil onto a turning ring with the

> size and shape needed for the glass rings being produced; from the glass cane that is thus produced, the individual coil-shaped windings are broken off and reheated so they can be evened up, at the same time the interior decoration and the closing of the ring thus produced also takes place.... In the production of these patented rings, the Weiskopf Company limited itself mostly to hollow gold-lined bracelets which became a very special article.... In 1913, the company found that it was necessary to issue a warning against imitations of these patented rings. Attempts had already been made in 1912/13 to imitate the coil ring in the bangles industry and after the patent ran out, it became an incredible mass article which contributed greatly to the upswing in the Indian ring business... (Meissner 1954:30, 31).

Various stages in the production of these coil rings can be demonstrated by several examples (Plate 8A); the bracelets of the Biedermeier period (Plate 8B top) are compared with the bangles of the turn of the 20th century (Plate 8B bottom).

Overlays, Stripes, Network and Filigree Glass

Many of the hollow-glass techniques (overlay, applied colored stripes, network and filigree glass, millefiori technique) were also used in making beads.

Overlay

Two or more layers of colored glass on top of each other made certain shades of color possible or enhanced the intensity of the exterior layer. The inner layer of glass was – even in the perfect bead – often not visible, but its effect was present nonetheless since the usually lighter-colored core enhanced the brilliance of the outer layer. The thicker a layer of glass was, the darker it appeared to be. This phenomenon could be counteracted by using a lighter core (Plate 16D). Cross-sections of rods and canes provide a view of the succession of layers: over the light blue lies a darker blue, sometimes clearly separated, sometimes embedded between darker areas, sometimes marbled (Figure 36). Frequently it was the red beads which were made with overlaid glass. Tubes of bright red glass consisted of two colors: opaque milk-white inside and a thin layer of bright red glass outside. "Not only are such tubes cheaper to make, the white opaque foundation also enhances the red color of the overlay" (Altmütter 1841:93). Certain kinds of beads consist of two layers of colored glass; opaque glass (*sottana*) can be overlaid with a layer of transparent glass of a different color. If a layer of white opaque glass is overlaid with a ruby colored glass, one gets a lively carnelian; the same ruby colored layer on top of an opaque yellow results in a very beautiful coral color (Bussolin 1847:12, 13).

Much of the needlework of the 18th century reveals a glimpse of the inner color of an embroidery or knitting bead: opaque white under brilliant red (Plate 11D); the white/red beads (white-heart beads) can be seen next to yellow/red ones in a wealth of tiny Venetian beads from the beginning of the 19th century (Plate 13B). According to Arnold (1909:89), the Riedel factory in Przichowitz also made overlay glass and striped glass for beads: "The production starts with hollow canes with angular or round cross-sections; these are mostly made of only one glass, sometimes of two different layers of color lying on top of each other, the inner core being opaque, the outer layer transparent or sometimes striped in color."

Applied Stripes

Surfaces decorated with straight or twisted stripes – from Venetian rods from the beginning of the 19th century (Plates 9A-9D) to the samples of the Hessen Glasshouse in Oberursel (Plate 7D) and the striped beads of differing provenance, including one unknown Austrian "Gablonzer" glass producer (Plate 5D) – demonstrate a production method which Keess and Altmütter describe:

> In Murano they also make stems for tobacco pipes which are usually overlaid with colored glass canes. The method of production is almost the same, only the softened colored glass is placed on the white glass gather right at the beginning and then the whole is drawn, and if the colored stripes are to look twisted, the cane is turned while running (Keess 1823:900).

> Raised parallel stripes and fluting can be had... by preparing the tubes from which the beads are to be made. This is usually already done at the glasshouses; thin, little glass canes are attached lengthwise all the way around the tubes, which adhere to them by being melted on. One has the power to either unite them with the tubes so that they form raised stripes or, choosing a different color, so that they melt completely into the glass. In both cases these little canes remain visible no matter how finely the tubes are drawn out; it makes a very excellent appearance in drawing... when tubes, canes, and such retain their original shape, so that, e.g., a one-inch thick, round, three- or four-edged glass rod still keeps its first shape even though it is drawn out as thin as

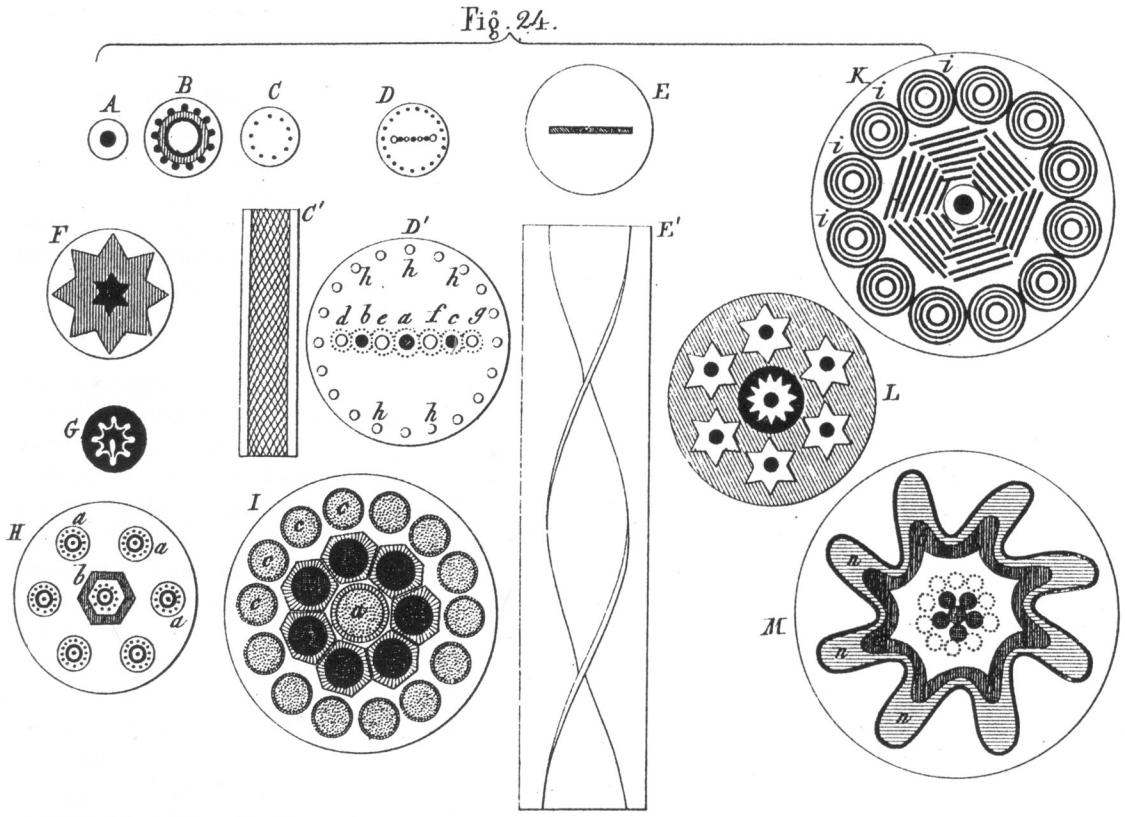


Figure 36. Filigree and millefiori glass (Karmarsch 1861a; Prechtl 1834:3, Figure 24).

> a hair.... The stripes, raised or smooth if they are melted into the tube walls, distinguishable through their different colors, can even appear twisted in a spiral on the finished bead if one either slowly turns the tube itself around its axis while it is in a soft state, or does the same thing with the blown bead... (Altmütter 1841:89, 90).

In making blown glass objects, brightly colored stripes are often applied freely as with the "rainbow-colored" glass from Fischer (1892:115-119). The color winds itself in wide stripes around the iris-glasses made by Stölzle.

Filigree Glass

Infinite variations of filigree and network patterns, found not only on the tall vases and wide bowls from Venice but also on glass beads, bear witness to the enormous skill of the filigree glassworkers.

> The name filigree glass is applied to those glasses which are put together from a larger or lesser number of little rods or threads, melted into a whole in which the enchanting net-like or spiral patterns are formed. These glasses are often called network or lace glass for this reason. This technique, although already partly known to the ancients and also practiced by the Byzantines as the reports of Theophilus prove, was first perfected by the Venetians and put to use in manifold ways (Karmarsch-Heeren 1880:49).

Bundles of tubes and rods with stripes, network, and filigree already came to the "Cabinet of Factory Products" before 1837 and 1839, as products from Dalmistro, Moravia & Co., Venice (called Dalmistro, Minerbi & Co. in 1839). Views of cross-sections show the tiny diameters of the differently colored canes which, arranged in a specific order, produced the most enchanting patterns (Plates 8C, 9C top). Sketches show the complicated arrangements for making the filigree, network, and millefiori glass very clearly (Figure 37). In 1861, Karmarsch illustrated the section on filigree glass, threaded glass, fine-net glass, and network glass with schematic drawings (Figure 36). I have put together several pages with such drawings using a French source from 1868 (Bontemps 1868) (Figures 38-40). Most of the later glass technologies go back to this source, as does Benrath (1875:353-355). The assortment of patterns from Dalmistro, Moravia & Co. (Dalmistro, Minerbi & Co. in

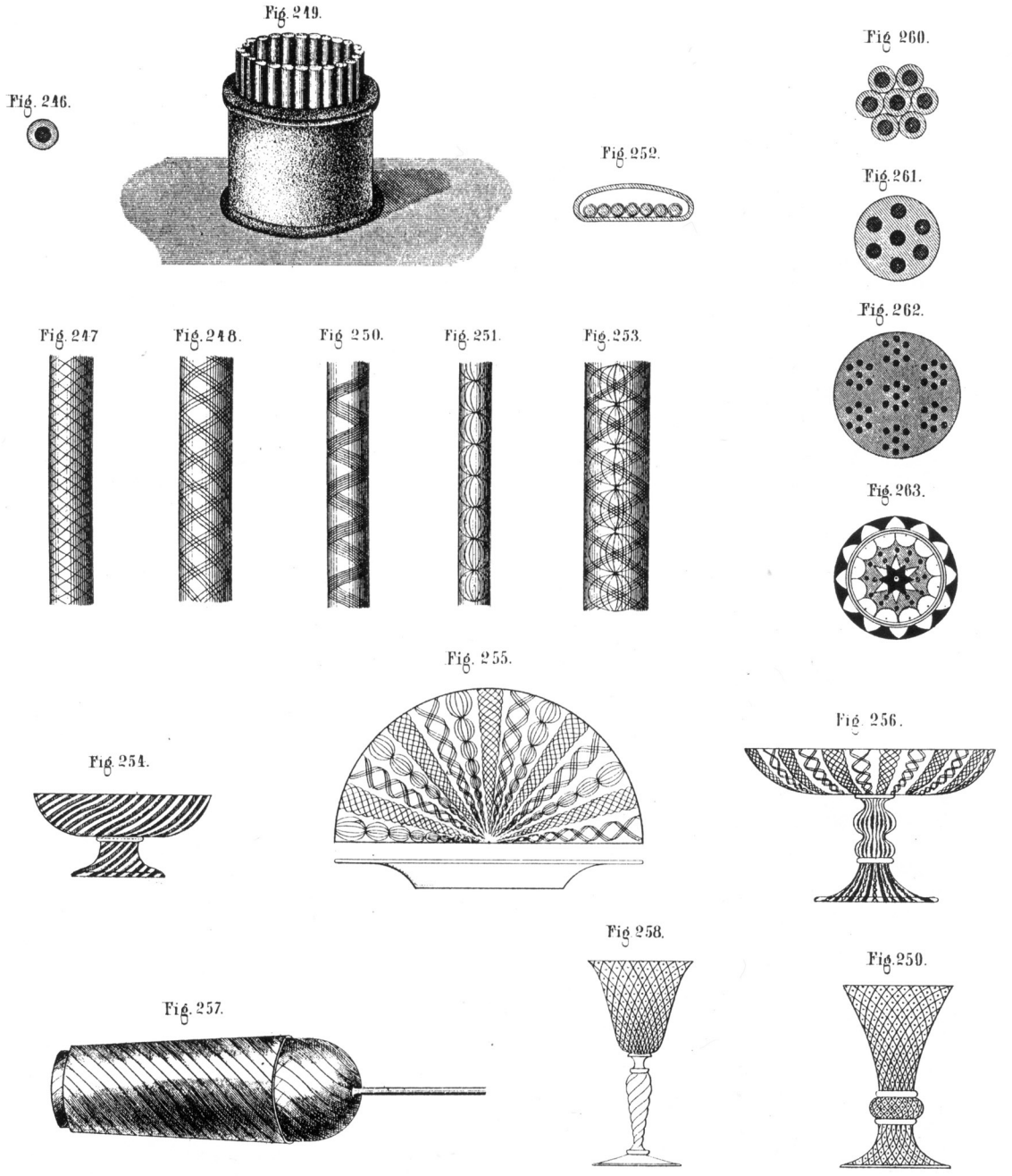


Figure 37. Production of filigree and reticulated glass (Tscheuschner n.d.: Plate XXIII).

1839) is large: it ranges from straight, applied threads all the way to rods with brightly colored twisted stripes, from transparent to translucent and opaque rods and threads. A picture of damaged samples shows the dimensions of the rods applied to the outside walls of the cane especially well (Plate 9C bottom) and three pieces of modern-day production illustrate the layering of millefiori glass (Plate 10A). Gablonz examples from the Biedermeier period are the straight or twisted striped rods for "pressed buttons" (Plate 8D).

Satin Beads/Atlas Beads

We should grant the beads with the silky striped look a special place (Plates 46C, 47A). The terms "satin beads" and "Atlas beads" are apparent synonyms. The designation

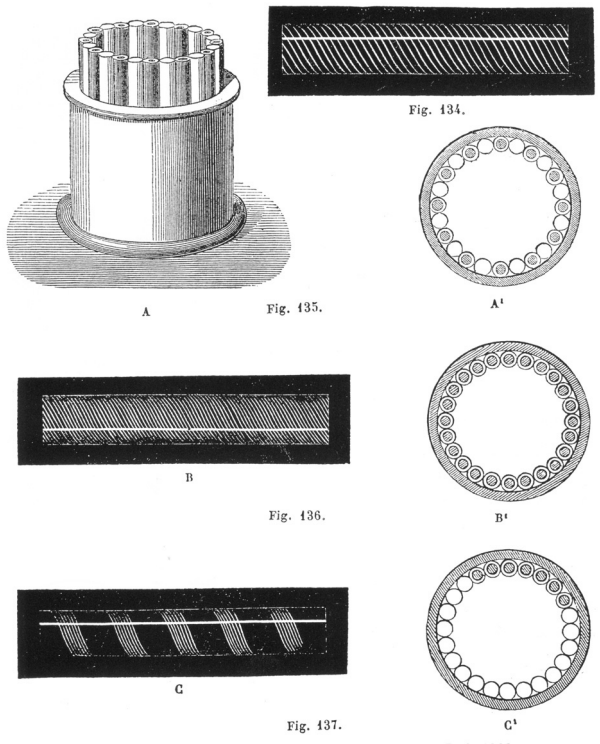


Figure 38. Network and filigree patterns (after Bontemps 1868:604, 605).

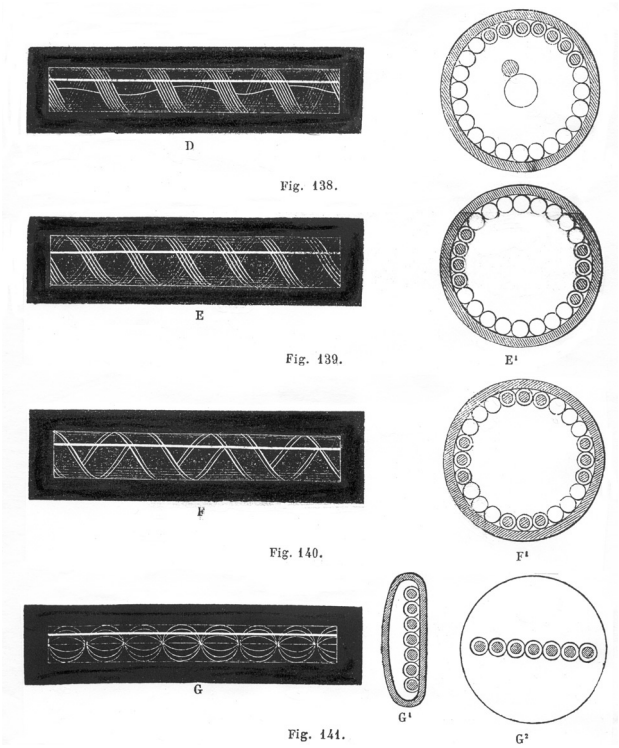


Figure 39. Network and filigree patterns (after Bontemps 1868:607, 608).

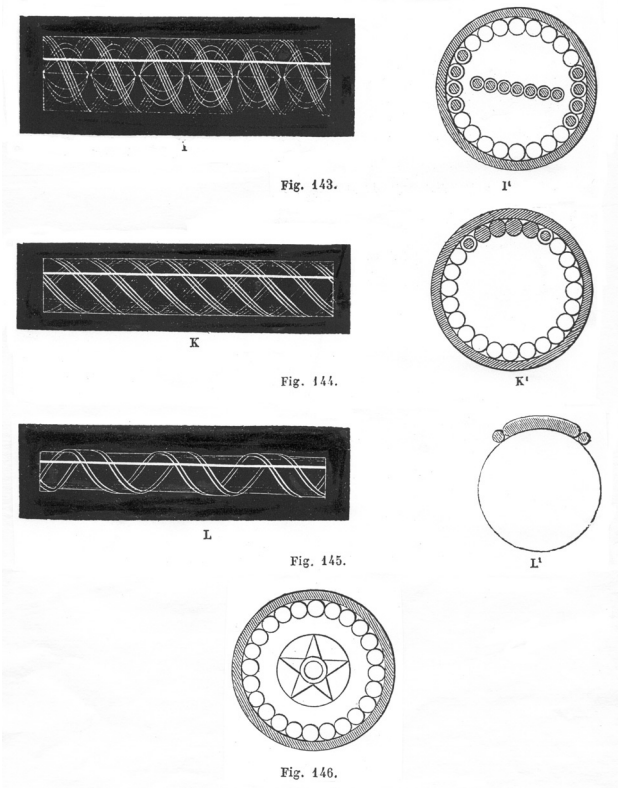


Figure 40. Network and filigree patterns (after Bontemps 1868:608-610).

"Atlas" bead is probably the more recent of the two. The expression "satinized" can also be found occasionally. The silky sheen, however, is sometimes feigned by a finely ribbed surface; beads made by this technique should not be called "Atlas beads," even though they can look very much like them. Altmütter describes these beads:

> There are also some beads which appear to be put together of shiny silvery threads, almost like plain white silk. This peculiarity lies in the characteristics of the tubes from which they are blown. Specifically to achieve this end, the glass is kneaded a number of times in a softened state, allowing air to get into it and which is also kneaded into it at the same time. When the glass is drawn, the air bubbles turn into extremely fine tubes which cause the striped appearance in the articles blown from it, also similar to mother-of-pearl by the way (Altmütter 1841:89).

On a chart of Ferdinand Unger, this type of bead is represented a number of times: "wound satin beads, satin beads, satin olives."

> In order to give the glass the pearl-like or shiny Atlas appearance, the glass must be stirred in the pot rapidly long enough for it to achieve the proper

> consistency. In the process, the important thing is to get as much air as possible into the glass and to divide it into the finest bubbles, through which the peculiar refraction and the Atlas sheen are created (Graeger 1868:121).

A sample card of the Mahla Brothers shows Atlas beads in an olive shape (Plates 40D, 41A) in different colors. "Beautiful blown Atlas beads of delicate, fine sheen" were exhibited by Simm & Comp. in Polaun at the German-Bohemian Exhibition in Reichenberg (Schindler 1906:1719). Beads of Atlas glass in various colors are also seen on a sample card of a company so far unidentified: "White, Aquamarine, Blue, Green, Topaz" (Gablonz Archive and Museum, Kaufbeuren-Neugablonz). If Winter (1900:86) speaks of the Atlas bead as "missing," other contemporaries contradict him.

Jet (Black Glass)

One speciality of Bohemian glassmaking was always black glass. The admiration for a large plate of black Hyalith made by Buquoy (Neuwirth 1993:51) was also bestowed on the basalt wares of Wedgwood. This term was not uncommon in Bohemia: Liechtenstern (1822:158, 159) already mentioned a "basalt glasswares factory" in Morchenstern and in 1829, in Prague, Franz Riedel exhibited "a pyramid of black basalt-like glass as a monument to the Battle of Leipzig" (Prague 1831:34). In the bijouterie and passementerie-stones industry (the centers were Gablonz, Tannwald, and Eisenbrod), the term "jet" later took over and is described as follows by Bucher (1883:130):

> *Gagat*, jet, deep black, shiny, semi-precious stone which is made into mourning jewelry, etc., belongs to brown coal or rock coal (cannel coal); the imitations in glass or hard rubber are recognizable; the former by their heavy weight and (upon touching with the tongue) by their higher temperature, and the latter by their turning gray.

Phonetically almost the same, *jais noir*, in the form of black glass rods, was used by Unger on a large eagle (Vienna 1845). In literature of the late 19th century, *Bijouterie-Jais* was commonly used as a synonym for jewelry made of black stones (Gablonz 1897:86), and the "black branch" ("black bijouterie, black hat ornaments," etc.) finally included all of the many products which used black beads and stones: passementerie, hat ornaments, brooches, bracelets, earrings, etc. (Figures 41-47).

The black "glue stones" (*Kittsteine*) are supposed to have been created in Gablonz around 1868-1869, after French models (the *articles de Paris*); because of the German-French

Figure 41. Black glass bijouterie ("jet"), probably early 20th century (private collection, Vienna).

war, the demand for this "black bijouterie" from Bohemia increased and then around 1896, declined drastically for a while (Gablonz 1897:86, 87). Around the turn of the 20th century, the passementerie-stones industry was an important branch of the production of the glass smallwares industry in the Isergebirge, as Winter and Tayenthal report:

> The category, passementerie-stones, includes all the different colored stones but mostly those made of black glass which are worked into hat ornaments and passementerie, also mostly used for adorning fancy clothes... their shape is manifold: perforated mold-pressed beads (*Flüssel*), hexagonals, squares, stars, pointed ovals, pear pendants, crosses, clover leaves, arrows, and hundreds of other figures and forms, which understandably do not fit into specific terms, are molded over an oil lamp in the sizes from 1½ to 6 lines in the mold-pressing works at Labau, Pintschei, Gistei, Schwarzbrunn, etc., in small-scale industries and in the Czech villages of the Semiler and Turnau districts in cottage industries. We are talking here about two different kinds of industry employing a total of some 3,000 male and female workers (mold-pressers, threaders, assemblers) in the trimmings industry: with the small-scale industry and the cottage industry... (Winter 1900:13).
>
> A second group working in non-precious metals are the "Gürtler" in the towns of Kukan, Seidenschwanz, Neudorf, Labau, Marschowitz, Dalleschitz,

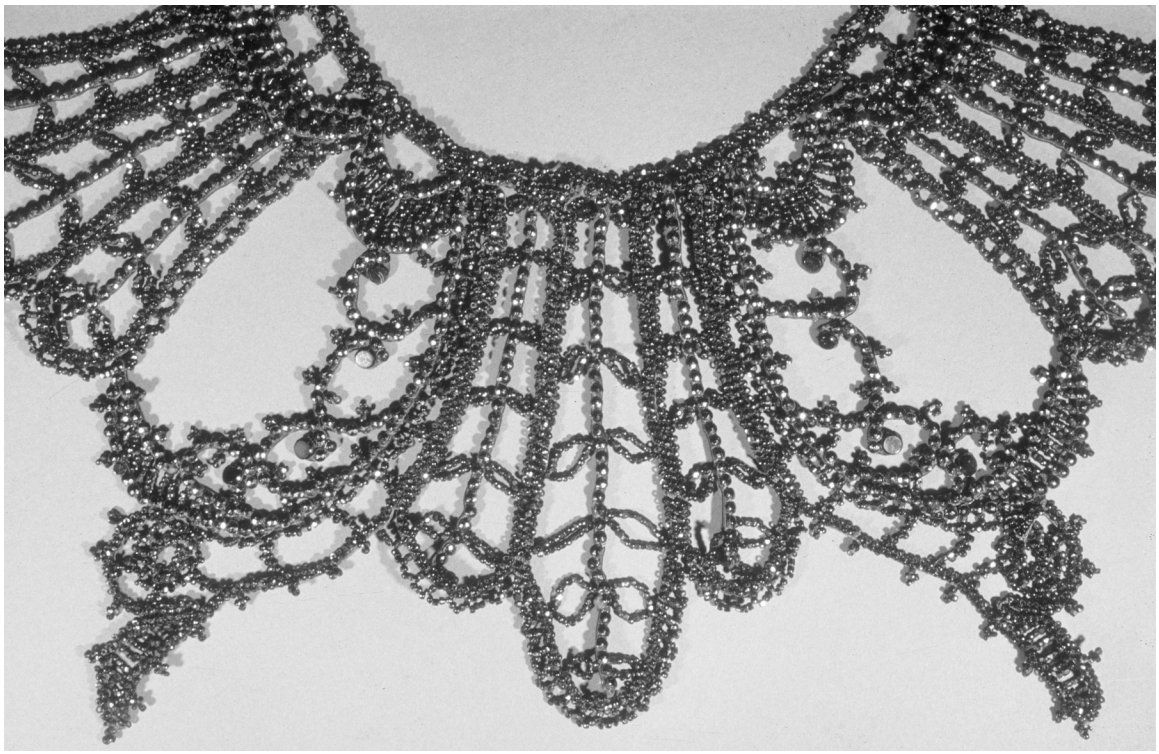


Figure 42. Passementerie with little black beads and stones, probably late 19th century; height of the detail: ca. 15 cm (private collection, Vienna).

Figure 43. Passementerie (probably a headdress) with cut and pressed black glass sections, probably late 19th century; length (crescent-shaped element): ca. 12 mm (private collection, Vienna).

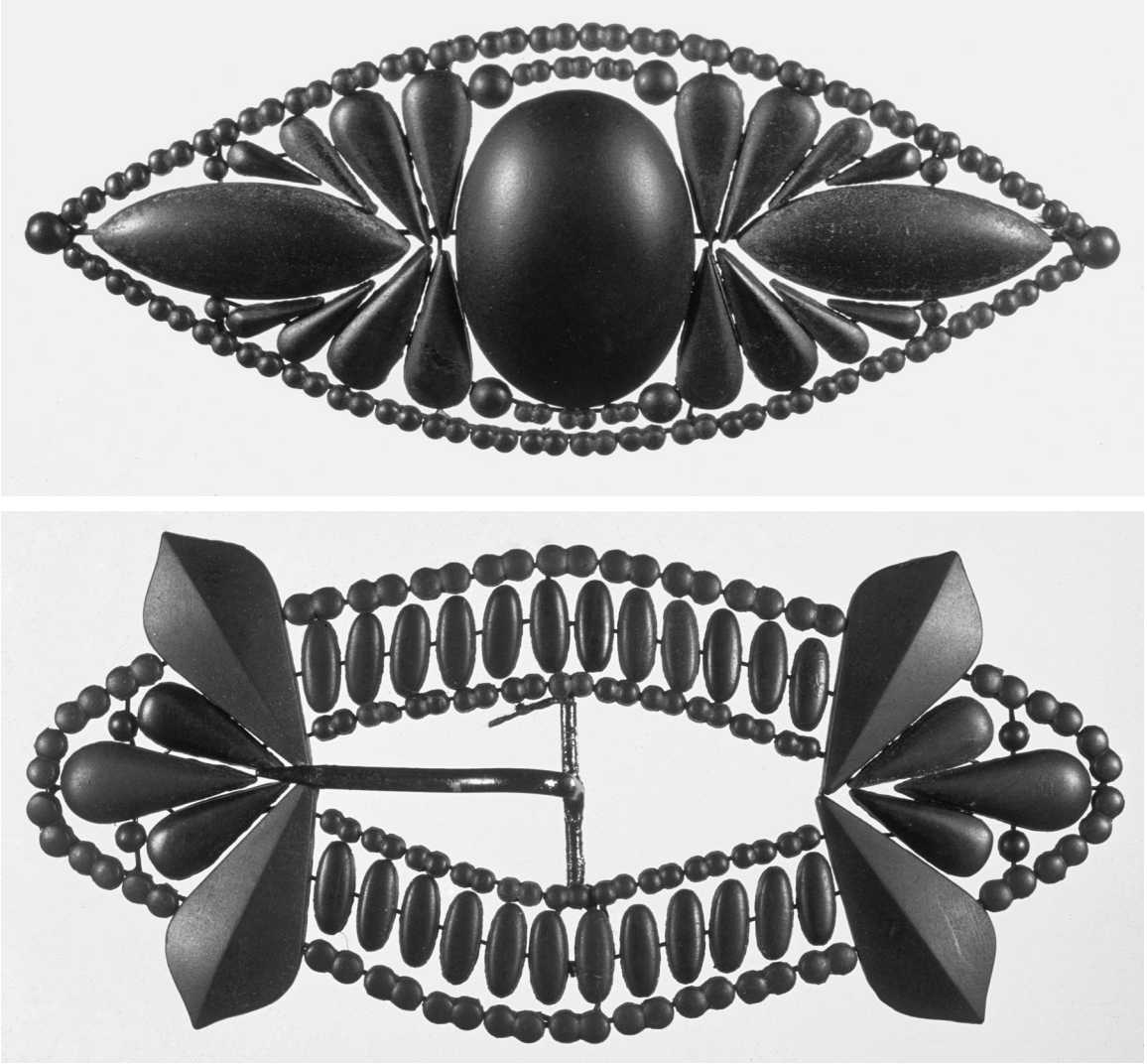


Figure 44. "Jet" brooches, late 19th century, Morchenstern; length: 11.7 and 12.0 cm (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

Puletschnei, Reichenau, and Radl, south and southeast of Gablonz, also in Schlag, Morchenstern, Ober-Tannwald, Albrechtsdorf, and Georgenthal, east of Gablonz. Here mostly the lesser articles of the trade are made, namely hat ornaments, jet and the like, the so-called black-work. This industry was brought to the Isergebirge about 20 years ago by a Tannwald glasswares producer from Thüringen and with time, was perfected. In this branch, there are only a little more than 100 tax-paying masters with about 250 journeymen and about 90 apprentices. In addition there are a fair number of unregistered handicrafts industries of the smallest category and numerous cottage industries. Altogether there are about 1,000 people working in this branch.... In addition, a series of small black-glass articles which are chiefly used as stones in the passementerie industry are made especially by lamp-molding and in only a few mold-pressing works besides.... Their sales are fairly constant and they have a steady acceptance in the passementerie industry of the Erzgebirge, as well as in those of Vienna and Paris and, when black hat ornaments are in fashion, in the hat ornament industry in the area itself... (Tayenthal 1900:14, 19).

At the German-Bohemian Exhibition in Reichenberg "black glass" was represented by a few special items:

> The jet-wares, modern women's jewelry in black glass made by the Feix Brothers in Albrechtsdorf and by Josef Ullmann in Morchenstern, have a charm of their own.... No less than 2,060 little stones

Figure 45. "Jet" brooches, late 19th century, Morchenstern, length: 11.7 and 12.0 cm (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

were used for one feather-shaped piece of jewelry, and one necklace is put together from 5,858 stones. These filigree-like pieces are built up on delicate wire frames and quiver at the slightest touch... just to show the heights the skill reaches; a button the size of a 20-heller coin, cut in 300 facets, gives us an idea of this as well (Schindler 1906:1721).

The black beads on exhibition, finely cut, up to 5 cm in size, in the widest variety of shapes, with one or two holes are used for hat ornaments... (Arnold 1909:90).

A special kind of raw glass on exhibition are the hollow, thin-walled glass spheres, of which only the fragments are used. They get their desired shape by cutting with the diamond or by being worked with the grinding wheel. The proper curvature is achieved by heating the piece on a clay mold so that it bends and takes on the desired curvature. Products made of black spherical glass by the Feix Brothers, Albrechtsdorf, and Josef Ullmann, Morchenstern, are exhibited: brooches, combs, clasps, buckles, hat ornaments of all kinds, etc., including numerous pieces of highly skilled work. All the pieces are composed of finely cut small stones for soldering and bent and finely cut spherical glass pieces (Arnold 1909:92).

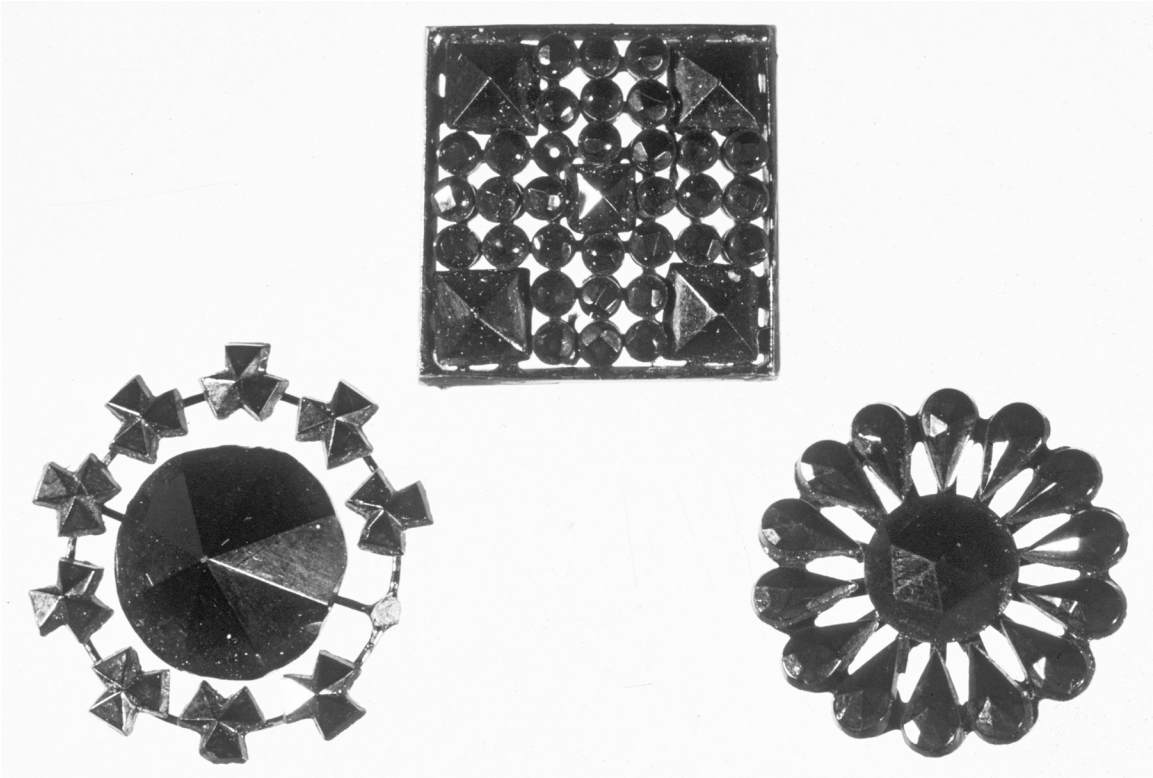


Figure 46. Black glass bijouterie ("jet"), probably late 19th century; square brooch: 2.7 x 2.7 cm (private collection, Vienna).

Today "jet bijouterie" is usually equated with mourning jewelry; this is not true to the degree of exclusivity, although the "mourning jewelry made of mat and shiny black glass" (Winter 1900:139) did indeed achieve an importance of its own.

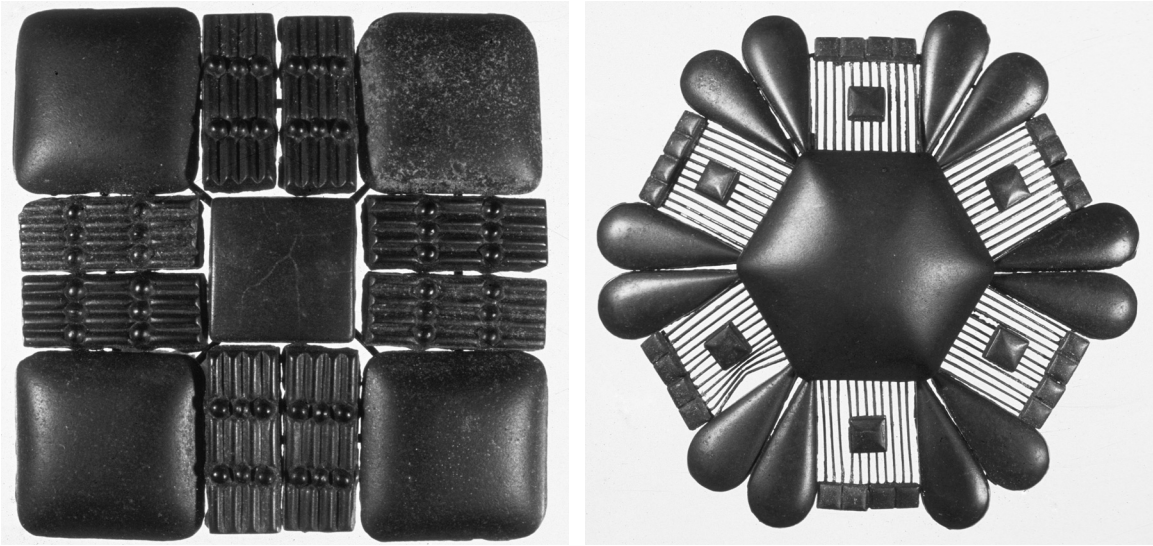


Figure 47. "Jet" brooches, late 19th century, Morchenstern; length: 11.3 and 12.5 cm (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

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

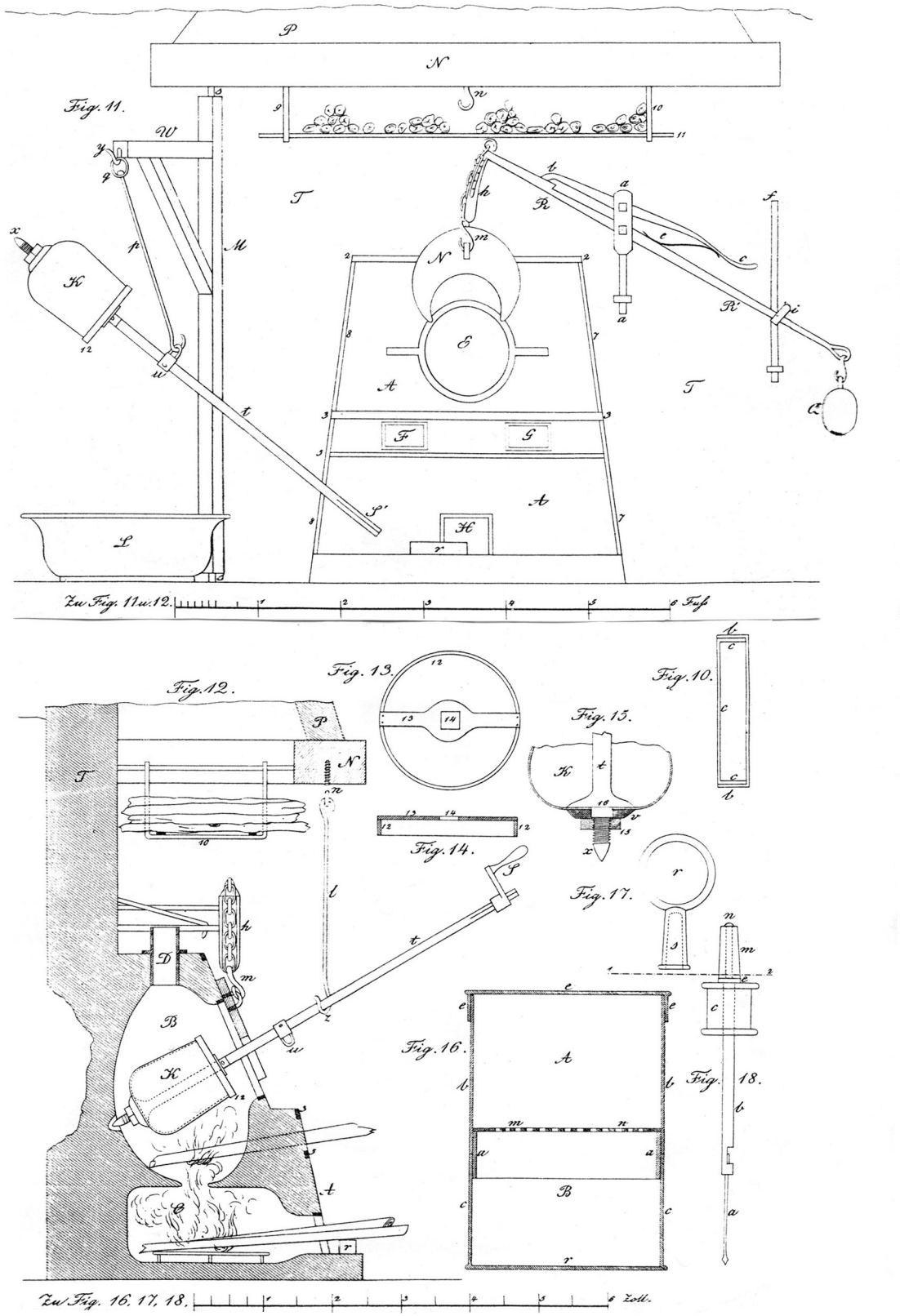


Figure 48. "New apparatus for rounding beads," probably after a privilege of Pusinich (Prechtl 1841, 11, and volume of illustrations, Plate 231).

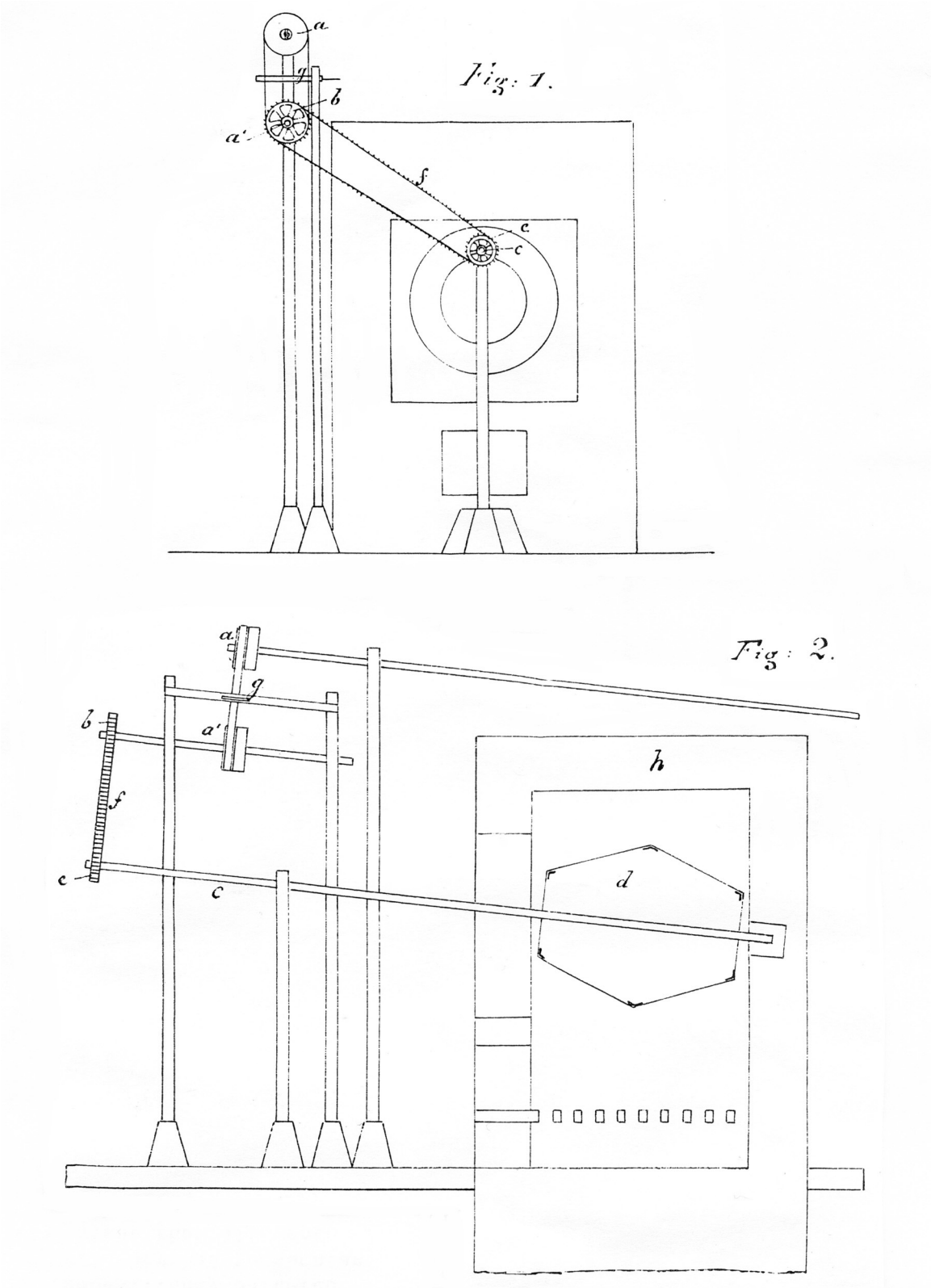


Figure 49. Machine for rounding beads, 1896, Luigi Millin, Venice, privilege no. 46/396 (Austrian Patent Office, Vienna).

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).

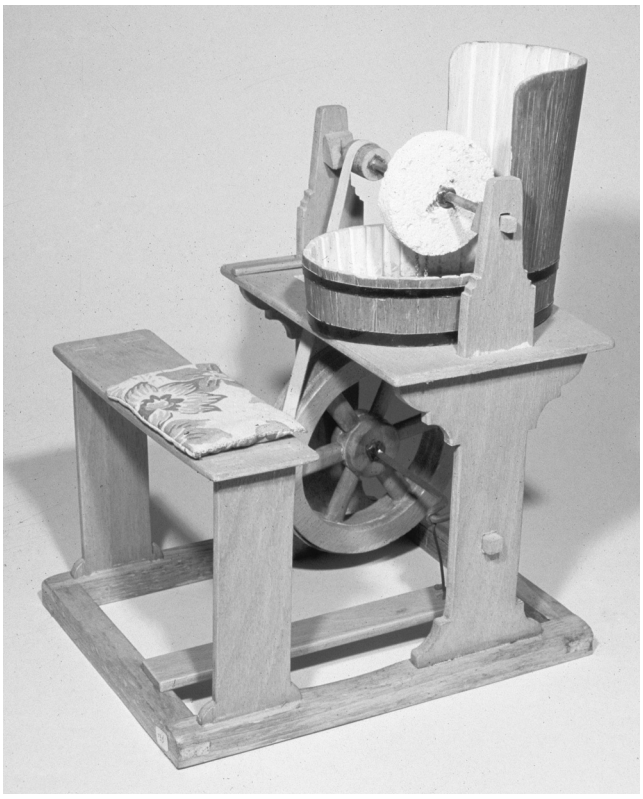


Figure 51. Model of treadle device (foot-driven grinder) (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

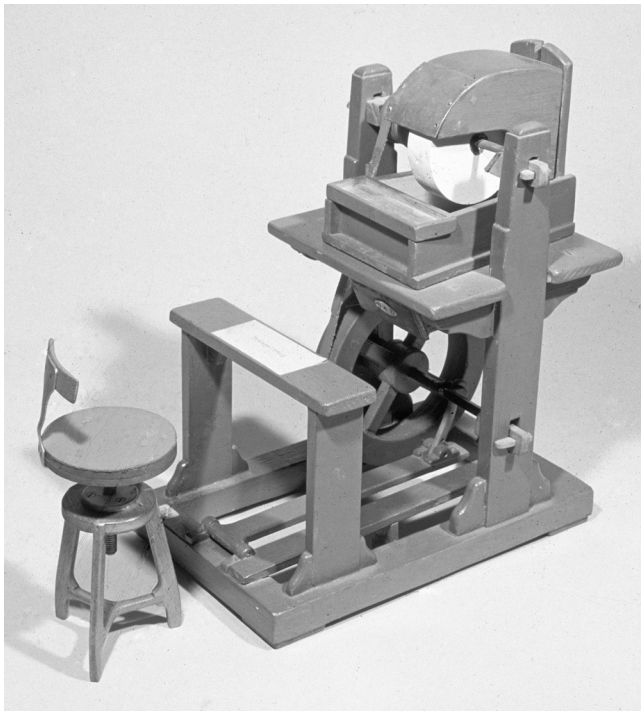


Figure 52. Model of treadle device (foot-driven grinder) (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

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).

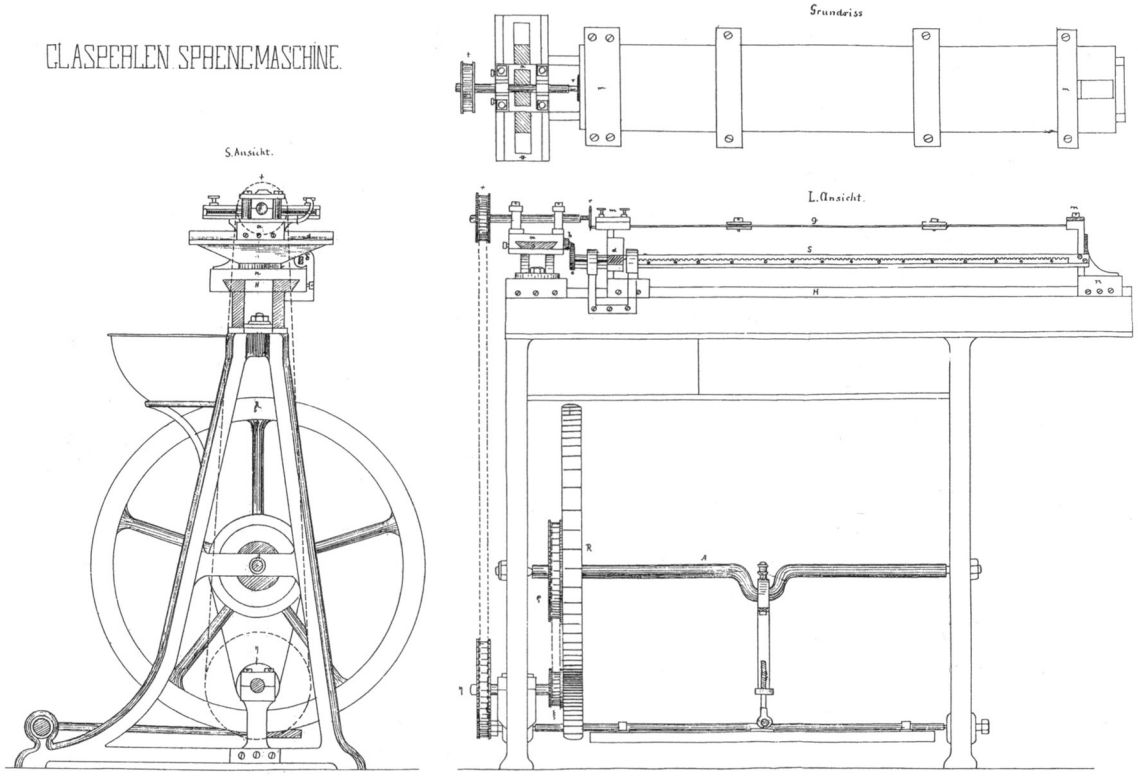


Figure 53. Machine for breaking off glass beads, 1877, Adolf Schindler, Vienna, privilege no. 27/112 (Austrian Patent Office, Vienna).

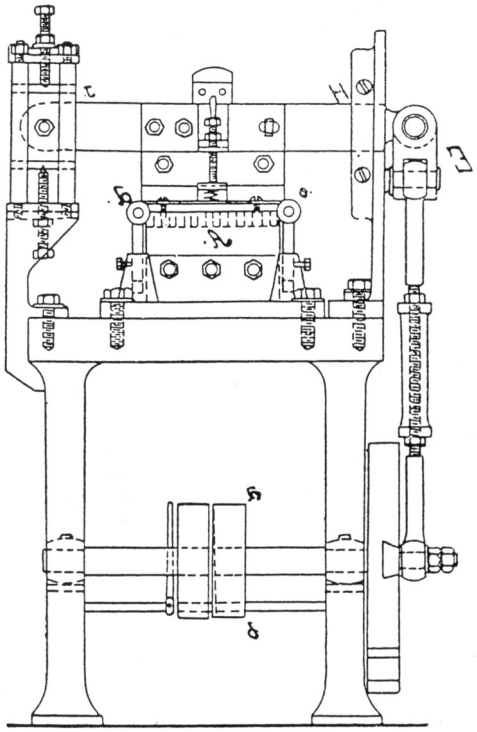


Figure 54. Machine for breaking off glass beads according to the "Venetian system" (Parkert 1925:147, Figure 32).

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

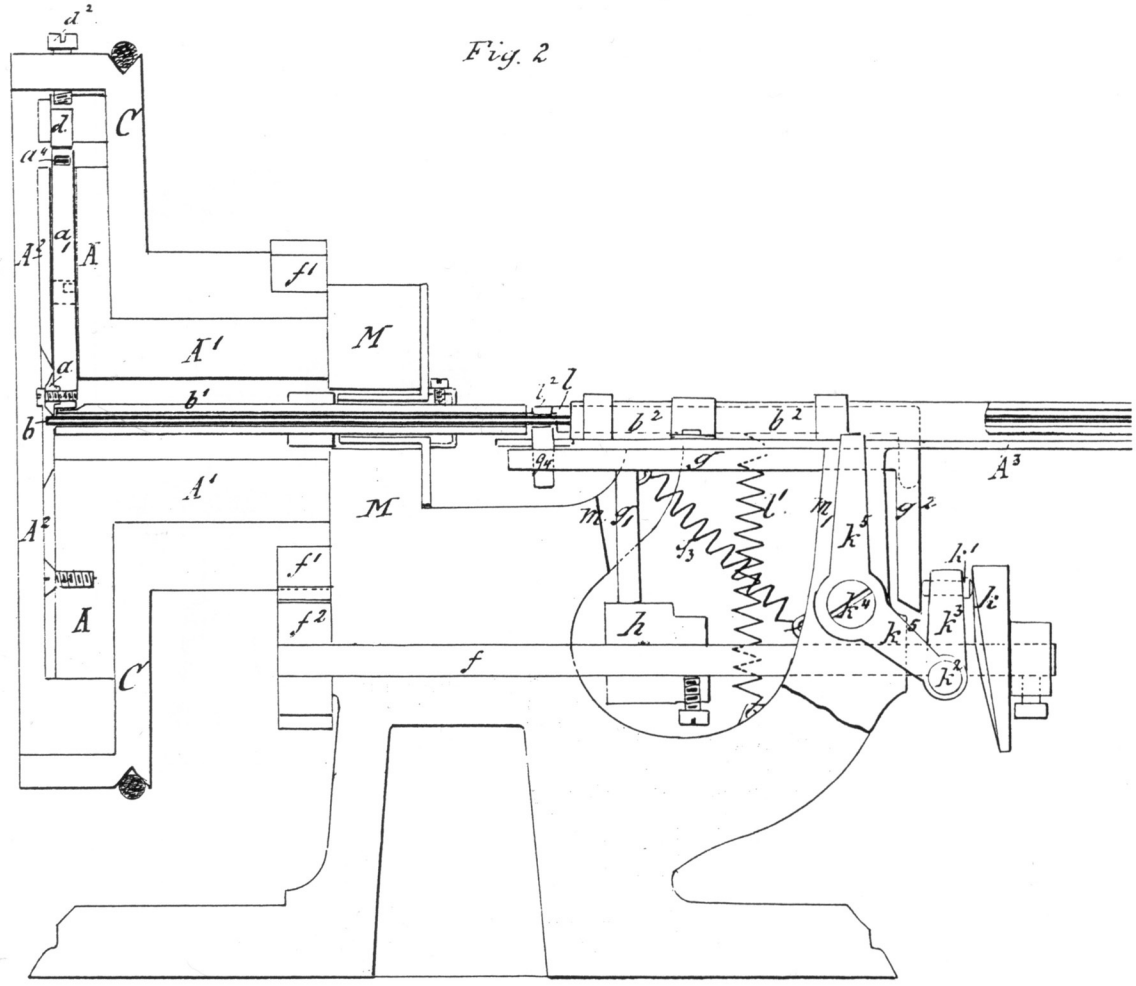


Figure 55. "Pinching" machine for cutting off beads, 1888, Jacob H. Jeiteles Sohn, Gablonz, privilege no. 38/2604 (Austrian Patent Office, Vienna).

> 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

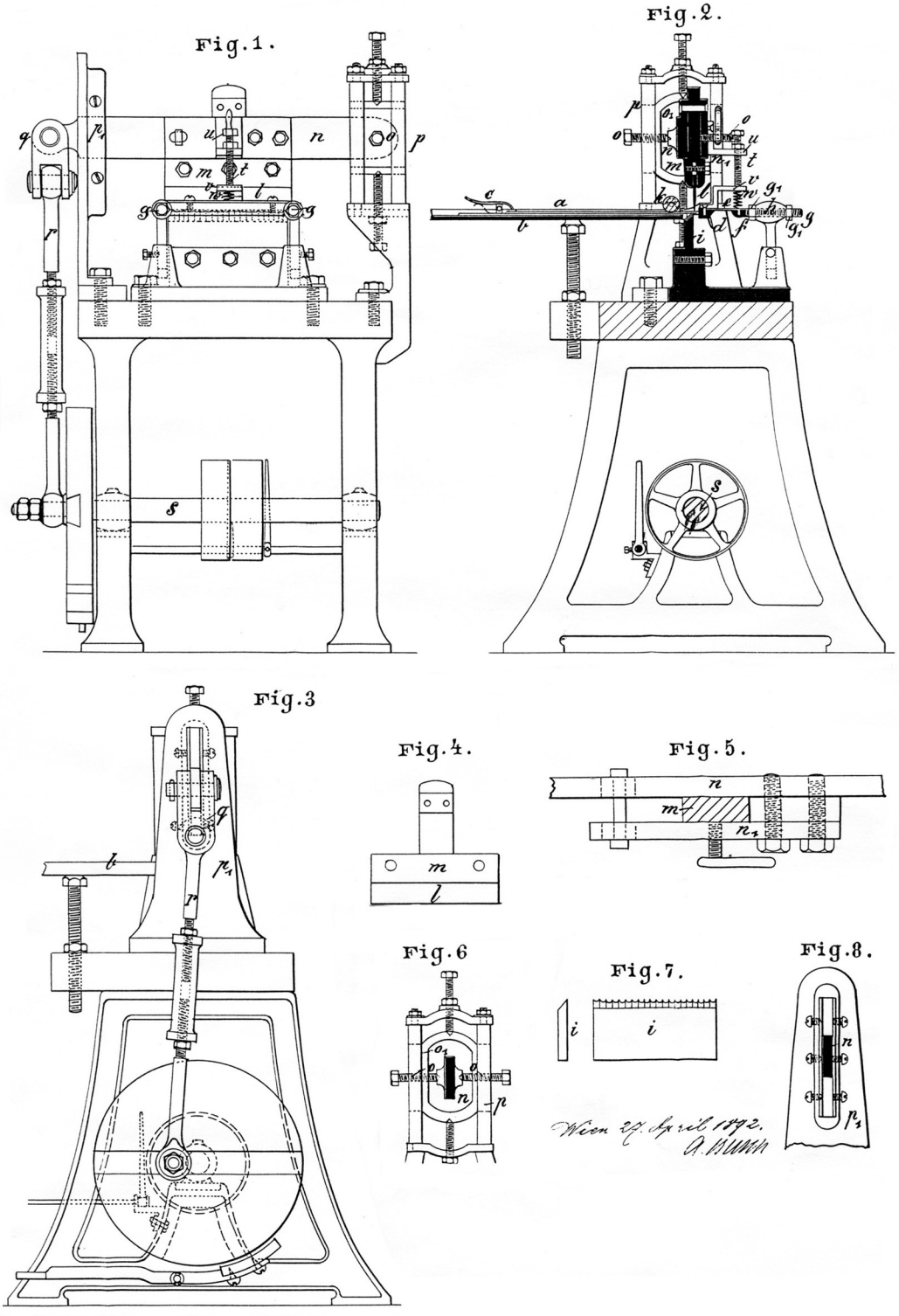


Figure 56a. Machine for making glass beads (Part 1), 1892, Wilhelm Kaulfuss, Goerlitz, privilege no. 42/4130 (Austrian Patent Office, Vienna).

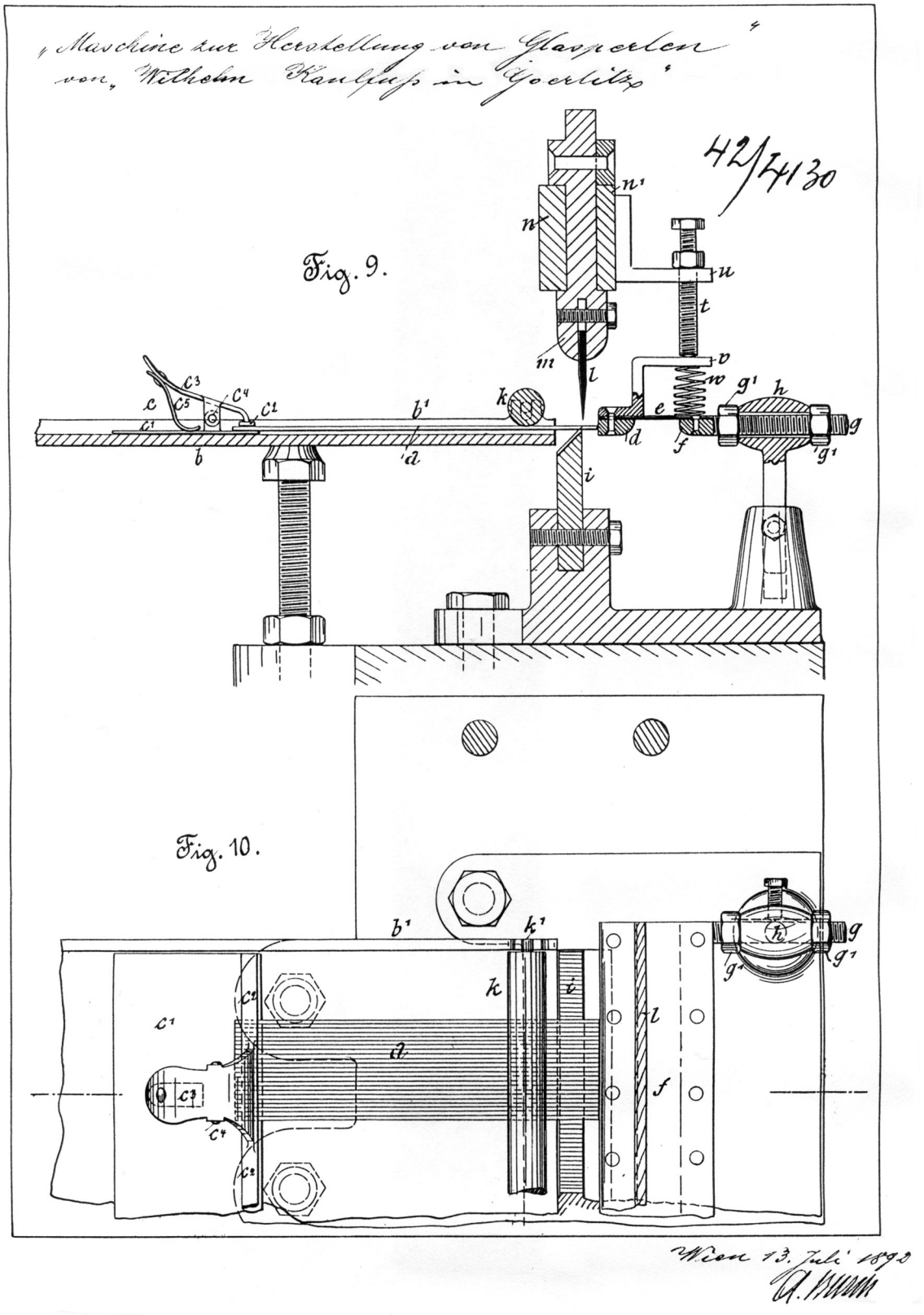


Figure 56b. Machine for making glass beads (Part 2).

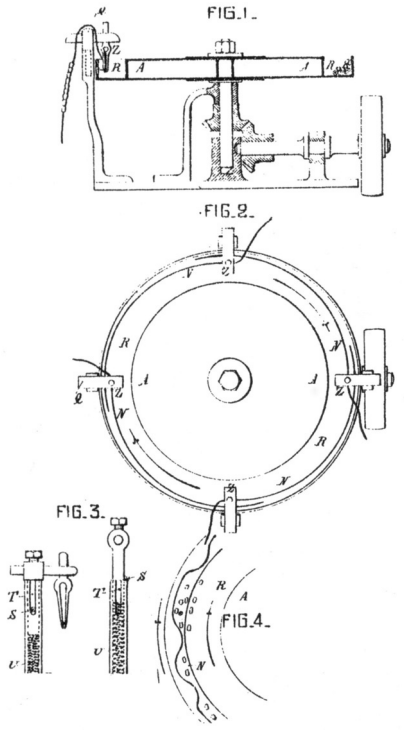


Figure 57. Threading machine, 1887, W. Klaar, Gablonz, privilege no. 37/2442 (Austrian Patent Office, Vienna).

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.

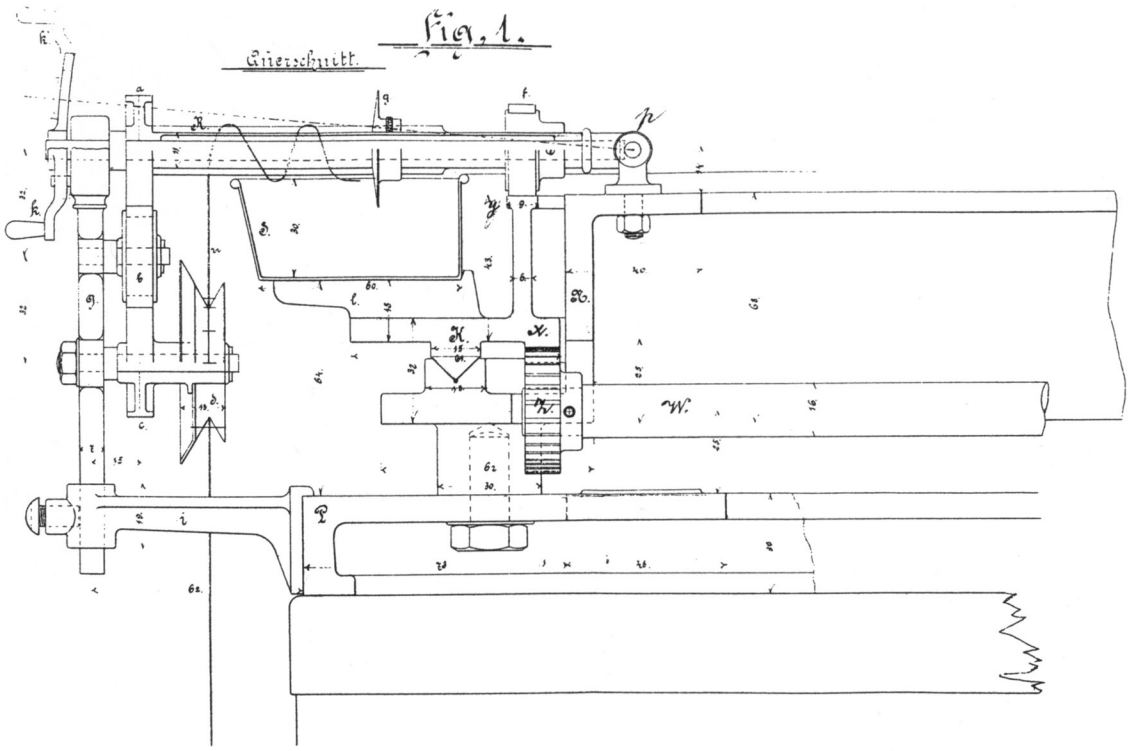


Figure 58. Apparatus for threading beads, 1891, Josef Riedel, Polaun, privilege no. 41/1891 (Austrian Patent Office, Vienna).

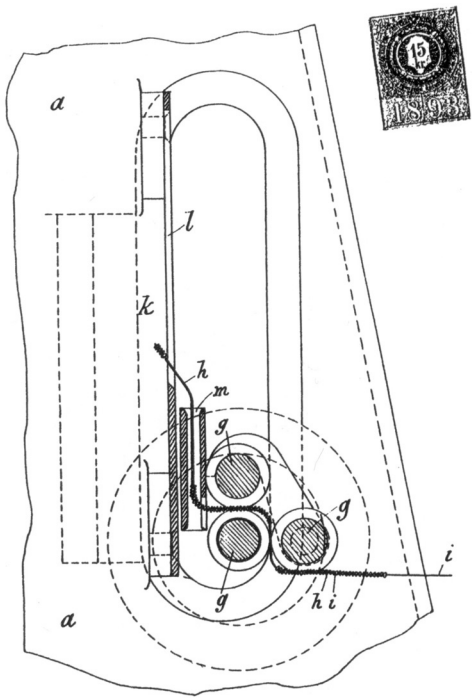


Figure 59. Bead-threading apparatus, 1894, Julius Krause, Wiesenthal, privilege no. 44/2785 (Austrian Patent Office, Vienna).

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

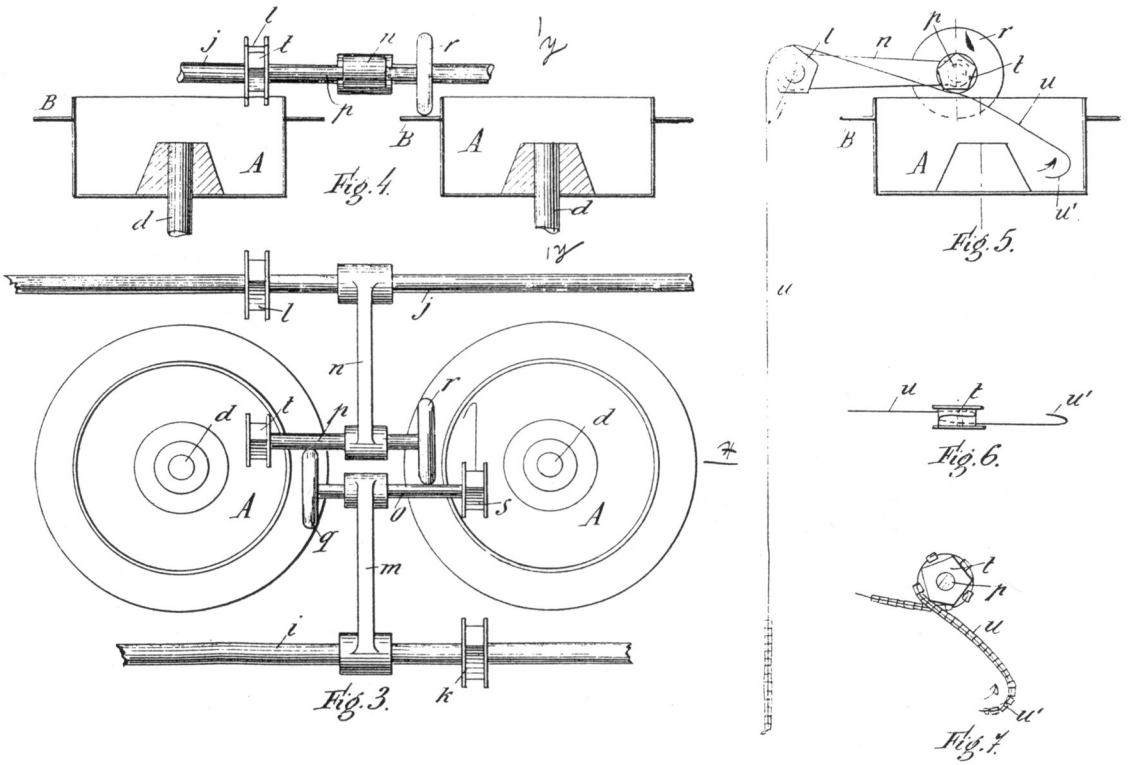


Figure 60. Machine for threading glass beads, 1897, Josef Dolenský, Jesený-Engenthal, privilege no. 47/5365 (Austrian Patent Office, Vienna).

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

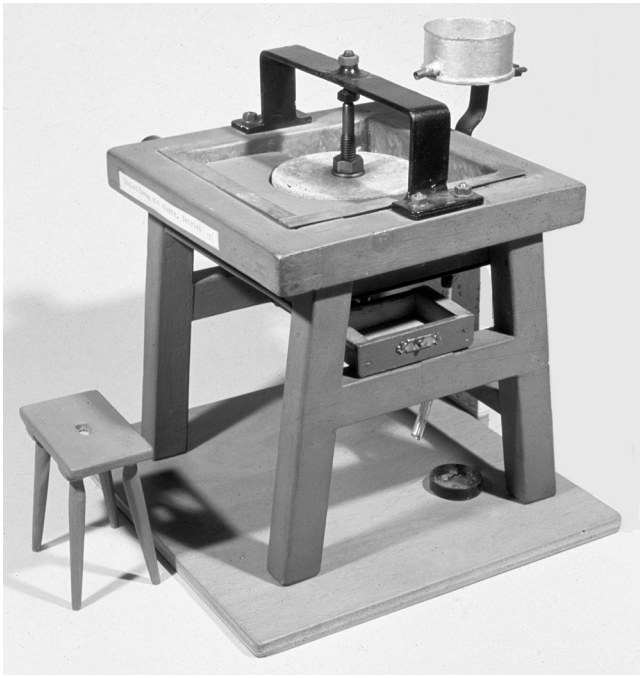


Figure 62. Model of a manual grinding apparatus with a tin polishing disc (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

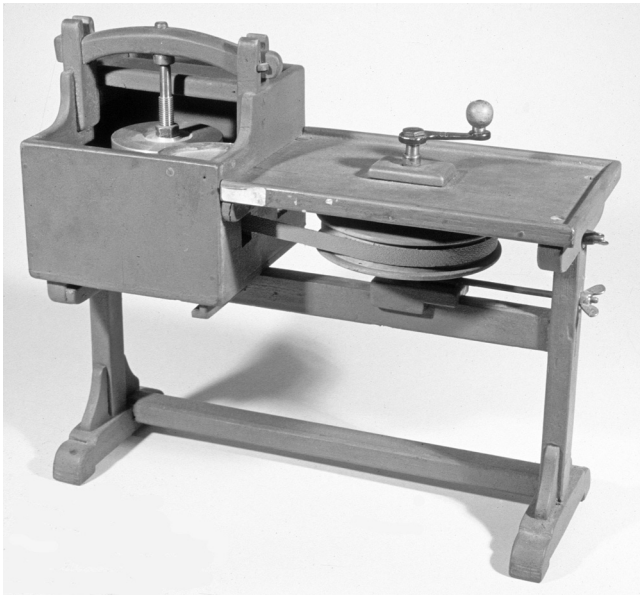


Figure 63. Model of an electrically driven grinding apparatus (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

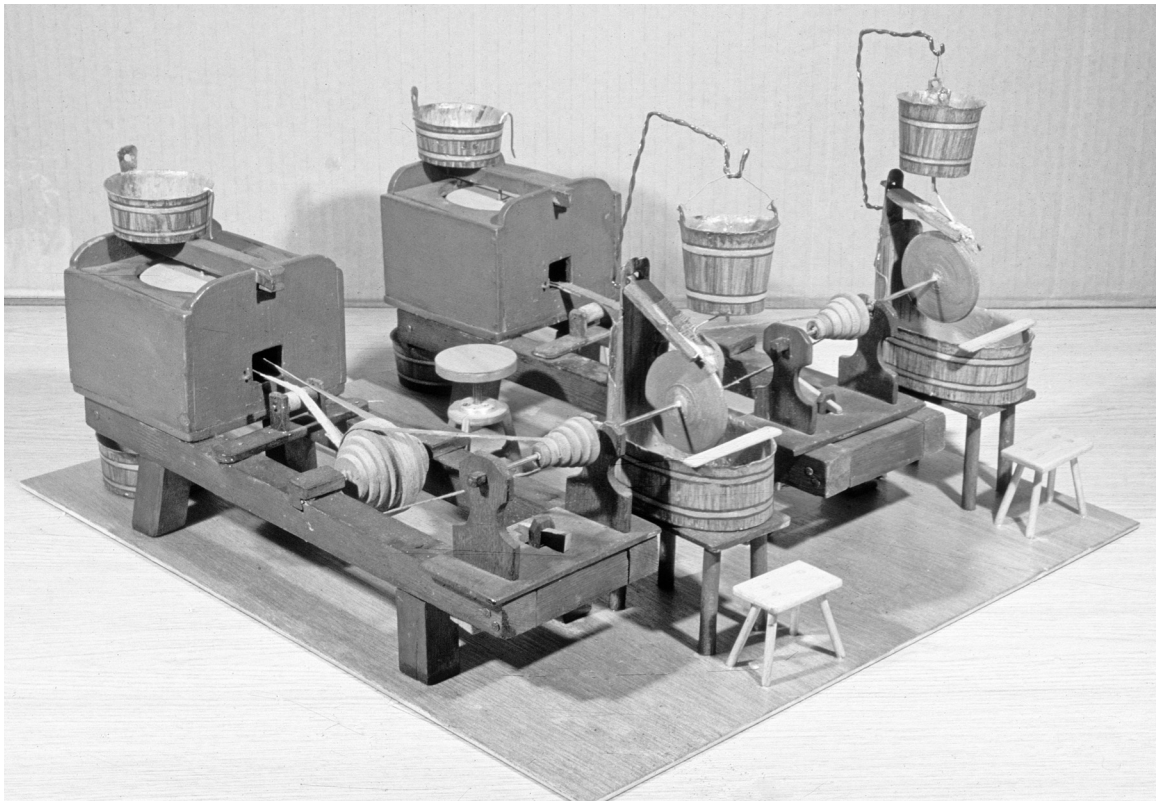


Figure 64. Model of a wheel bench for grinding smooth surfaces (English work)(Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

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

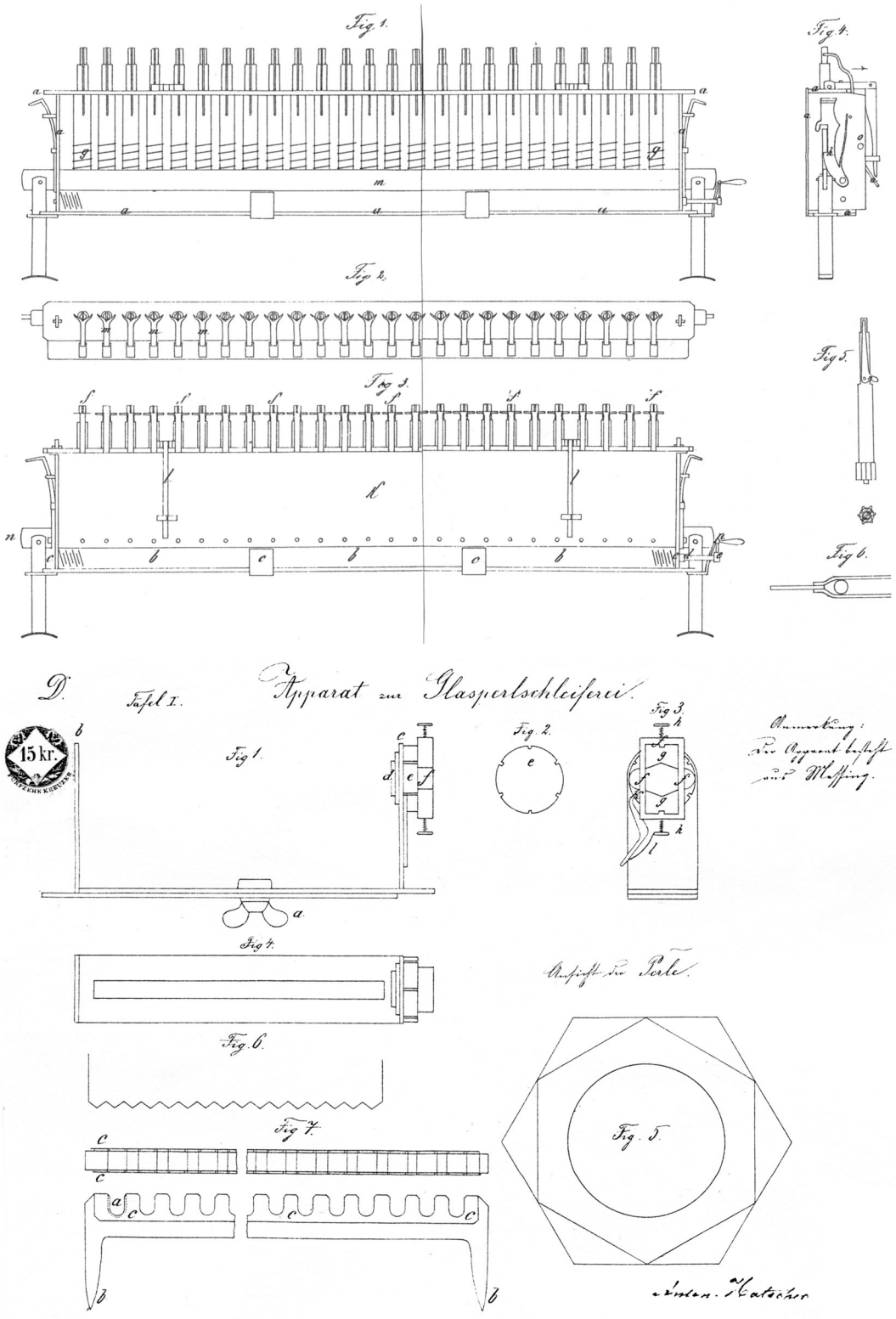


Figure 65. Apparatus for cutting glass beads, 1868, Anton Hatscher, glassmaker in Haida, privilege no. 18/209 (Austrian Patent Office, Vienna).

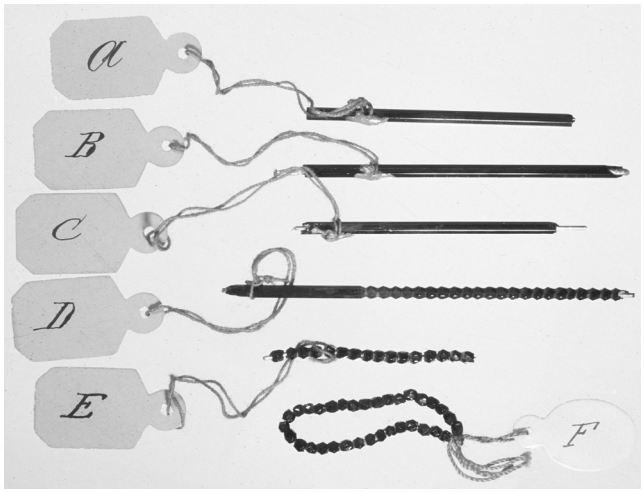


Figure 66. Method for making small cut-glass beads (enamel), Gustav Strauss & Co., Gablonz, 1889, privilege no. 38/3267 (Austrian Patent Office, Vienna).

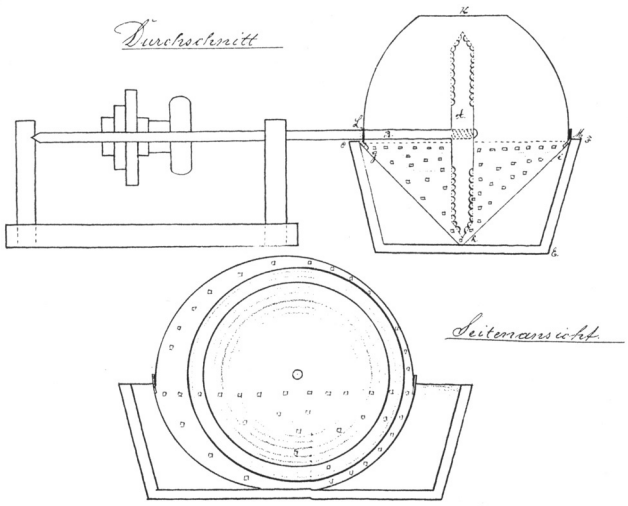


Figure 67. Method and apparatus for cutting glass beads, Emanuel Rössler, Wiesenthal, 1888, privilege no. 38/3129 (Austrian Patent Office, Vienna).

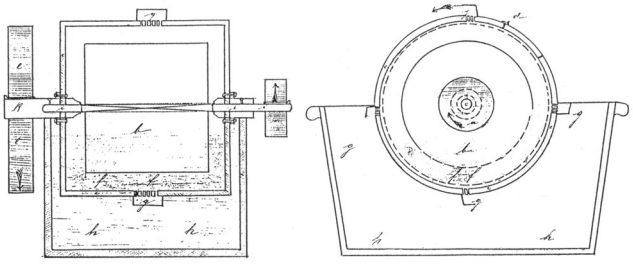


Figure 68. Device for cutting glass beads, Adolf Bayer, locksmith in Gablonz, 1888, privilege no. 38/1991 (Austrian Patent Office, Vienna).

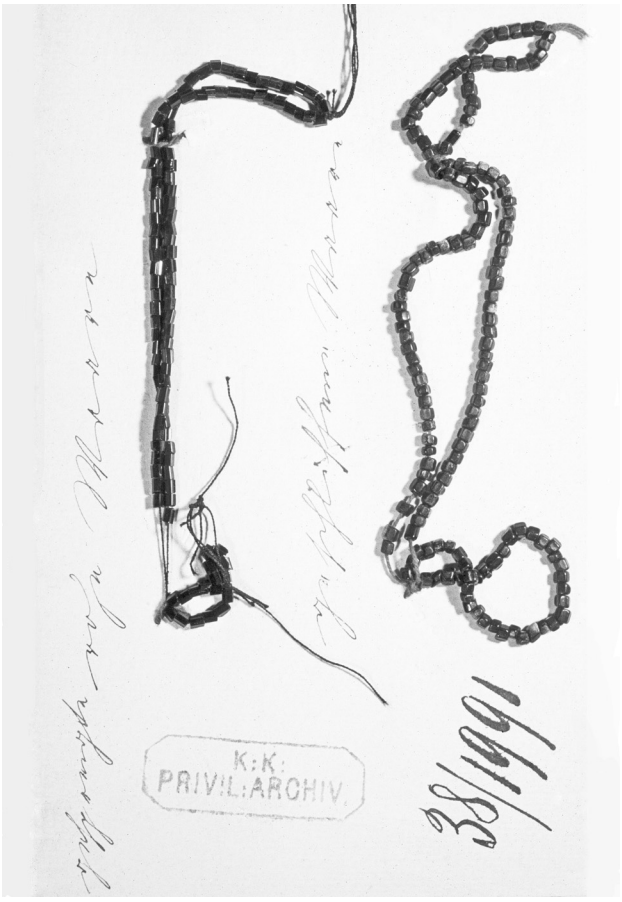


Figure 69. Sample accompanying privilege no. 38/1991.

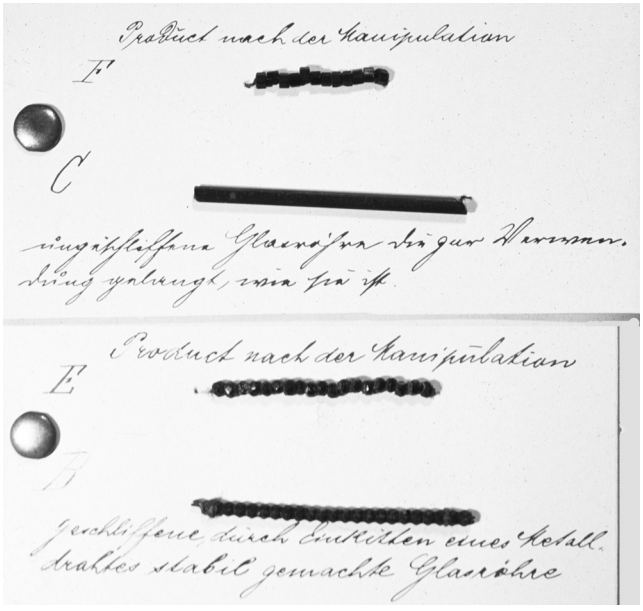


Figure 70. Innovations in the method for making glass beads, 1889, Gustav Strauss & Co., Gablonz, privilege no. 39/1892 (Austrian Patent Office, Vienna).

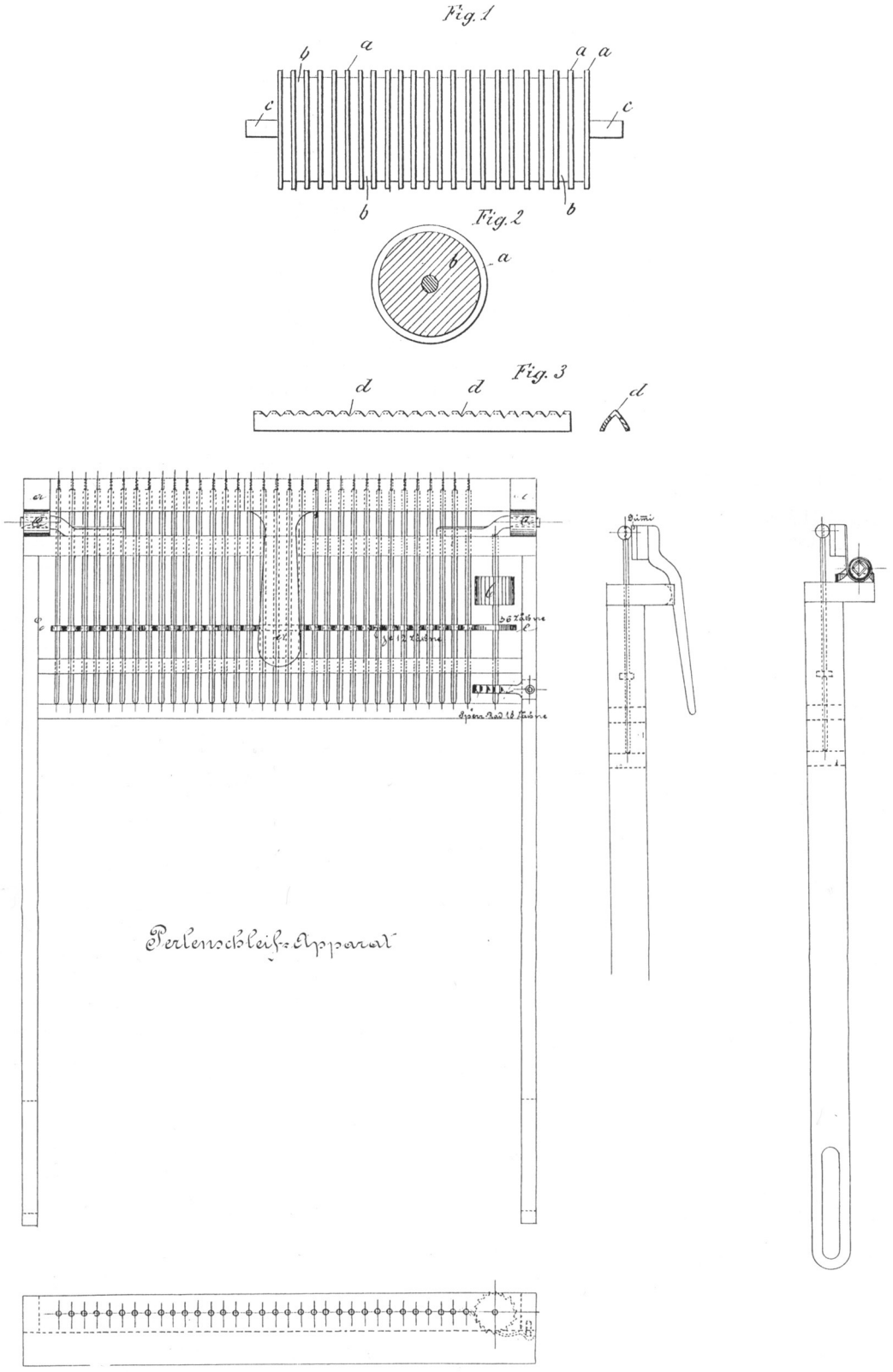


Figure 71. Apparatus for cutting beads, 1889, Dr. Weiskopf & Co. as cessionary of Anton Schöler, glasswares manufacturer in Wiesenthal, privilege no. 39/2276 (Austrian Patent Office, Vienna).

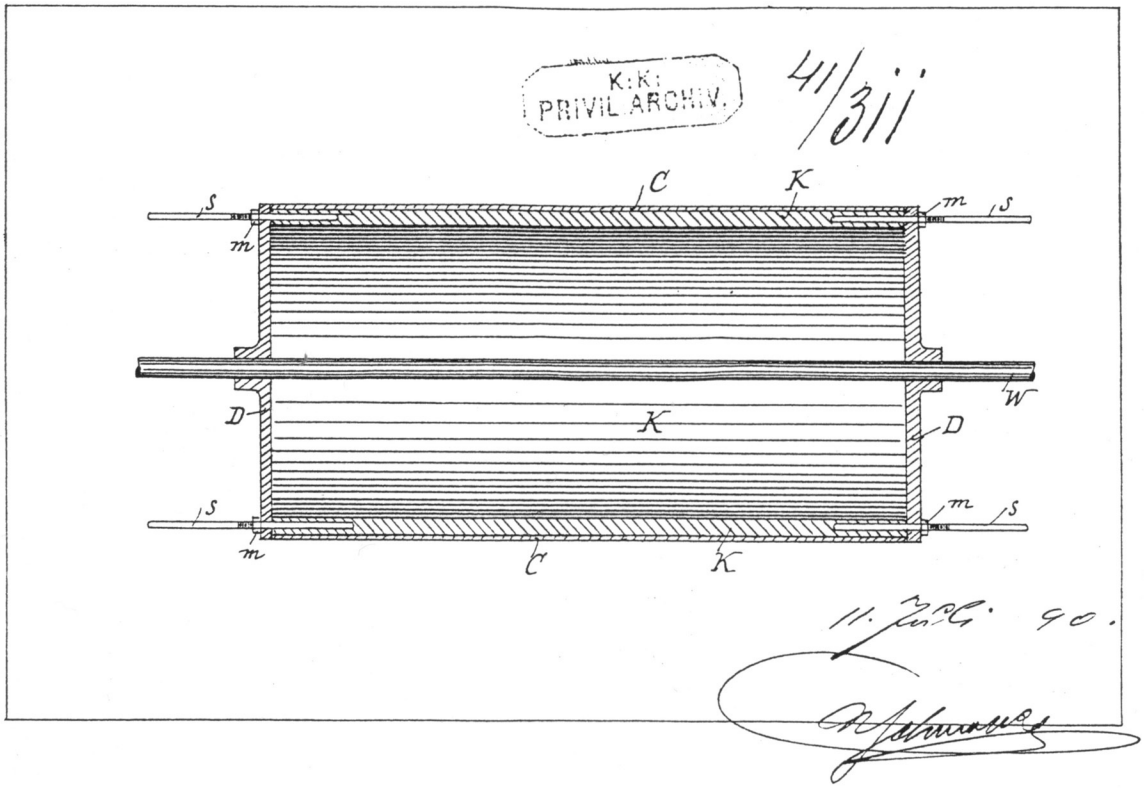


Figure 72. Apparatus for round cutting glass corals, 1891, Anton Schmidt, Friedstein, privilege no. 41/311 (Austrian Patent office, Vienna).

Figure 73. Sample accompanying privilege no. 41/311; globular beads before round cutting, elongated beads already cut and polished.

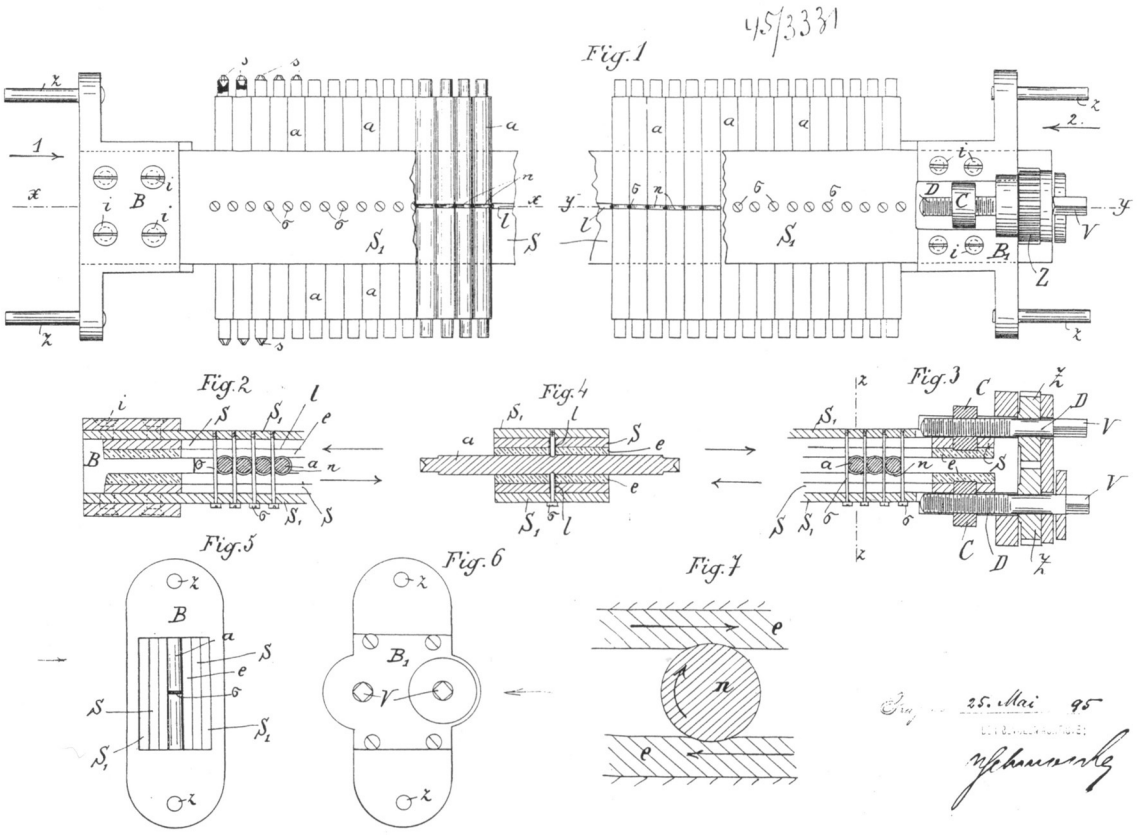


Figure 74. Apparatus for cutting glass stones, precious stones, beads, etc., 1895, Daniel Swarowski, Franz Weiss & Armand Kosmann in Johannesthal, privilege no. 45/3331 (Austrian Patent Office, Vienna).

with the first attempts at technical improvements in bead production concerned with giving a solid bead a special shape by pressing.

In Bohemia at the beginning of the 18th century, according to Schreyer (1790:93), the Wenzel Brothers and Franz Fischer in Turnau had already "invented a different means... using iron pincer-molds for pressing 10 to 15 and more of the same stones at one time, so that proper facets appeared on each pressed stone with this method because the iron mold was already shaped that way...."

In a report by the Count von Zinzendorf from the year 1774, there is already talk of a pair of tongs with a mold in which the desired figure is "pinched" (Kleinert 1972:17). The introduction of molding in Gablonz is attributed to a "certain Endler" by Benda:

> The invention of "molding" stones into shapes has caused the stone-cutting profession to be reduced to a common trade. In Turnau they already practiced this molding in the last century, but kept the secret of how to do it very strictly.... Nevertheless, a certain Endler from Gablonz must have succeeded in finding out something about it, since he established the first molding hut in Gablonz toward the end of the last century. This Endler, known under the name, "the old molder," must have been born around the year 1760 and was, to a certain extent, a genius.... But just as peculiar as brilliant, Endler knew how to make inventions better than how to make money with them. He had to be in a good mood to mold a few hundred dozen stones for someone, after good money and a lot of persuasion.... And so it turned out that the composition molding works in our area were not developed further and were at a very low state for a while after Endler's death.... It wasn't until the years between 1817 and 1820, that Anton Mai, No. 146, erected the first composition furnace in Gablonz (farther away in the mountains there was a certain Seidel who was supposed to have made compositions earlier) and he made ruby and garnet-colored compositions which he molded into beads. His first molders were Abraham Dubsky from Turnau and Wenzel Jäckel from Gablonz... (Benda 1877:281 ff.).

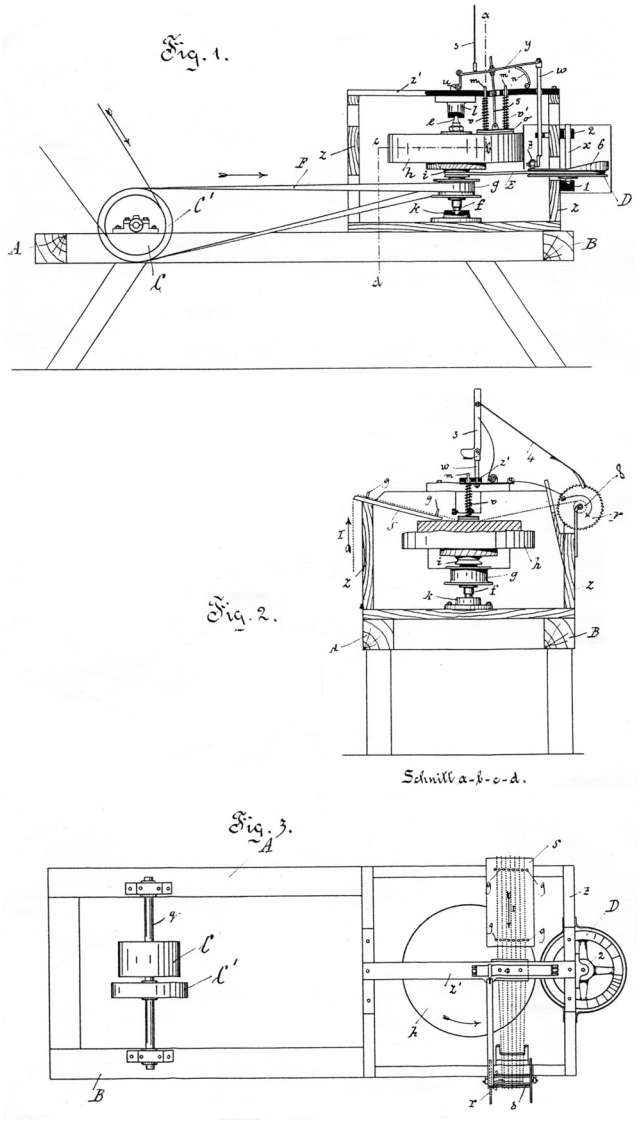


Figure 75. Bead-cutting machine, 1887, Stefan Hellmich, bead refiner in Wolfersdorf, Privilege no. 47/4347 (Austrian Patent Office, Vienna).

Lilie reports on the situation of glass molding at the end of the 19th century in detail:

> Glass molding... concerns itself with the molding of stones, buttons, beads, kernels, laurel berries, cubes, and so on. The method of production is already indicated in the word, "mold." For this the molder uses iron tongs into which is engraved the shape of the particular design which the article is to acquire. The production of these molds (called *Kappel*), i.e., the main component of these tongs, gives work to many engravers, specifically in Gablonz and its environs. In order to protect their designs, some of the exporters of such *Kappel* make them in factories built especially for this purpose. One of the first molders was a certain Endler (beginning of this century), Waldgasse No. 10 in Gablonz, not far from the furnace of Clemens Huyer. Among the molded glass articles made during the years 1867-1873, the little glass stones with holes, the so-called *Flüssel*, had especially enormous sales. In molded buttons and the like, either holes for sewing, threading, or attaching were pressed in with the mold or metal shanks were inserted as a part of the molding process....
>
> Molded beads, mostly black, but also in all the other colors, are molded in iron molds in the molding works, then cut in different ways and decorated (iridized, etc.) for sale. If the pressing is done in molds of steel or nickel (which makes the corners turn out more sharply defined and the surfaces smoother), then they are called "polished" beads (*geschmirgelte Perlen*); these are usually not cut, but supplied to be used in this state... (Lilie 1895:164-166).
>
> By polished buttons one means those which are not cut, but which are made to imitate cut buttons by using a press-mold that is polished so smooth on the inside with an abrasive that the buttons pressed in them acquire the appearance of being cut (Benda 1877:287).

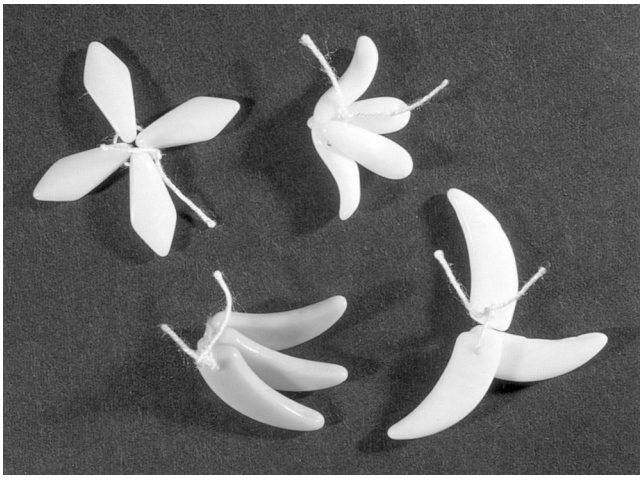


Figure 76. Various shapes of pressed beads (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

Another source mentions that the so-called polished bead was pressed in hot nickel molds which gave it a surface that looked almost cut (Fischer Collection n.d.). Arnold (1909:92) calls *Flüssel* "little black stones:" "They possess

two pierced holes and are put on the market on threads to be used for passementerie."

"Up to the beginning of the 70s, the molding furnaces were heated exclusively with wood, later with mineral coal, in more recent times with oil" (Labau n.d.). While molding with iron tongs over an open wood or coal fire was common, the Mahla Brothers company in Gablonz introduced glass molding using hydrogen into its factory in Morchenstern in 1891:

> This new type of fabrication resulted in a much more perfect method of production since the glass becomes white-hot much quicker because of the intense heat of the hydrogen gas and appears much sharper in the pressed design. In this way, a molded ware is produced that is so close to the cut ware, laymen are hardly able to distinguish between them (Gablonz 1898:161).

At the turn of the 20th century, Winter (1900:16) reports on molders and the use of double molds which were forbidden at times.

The Molding Technique and its Apparatuses

The solid bead molded in two-part molds was made either with or without holes. Articles intended for mounting (e.g., earrings, etc.) did not necessarily require perforation (Plate 15C). A tong-like tool (Figure 77) had always been necessary for pressing or "squeezing" and in the course of time had been improved upon a number of times. In the beginning, it took two people to perforate a bead; one to mold it, the other to make the hole:

> The production of hand-pierced beads required 2 people, a molder and a piercer, who sat opposite each other at the molding furnace. The molder guided the melting end of the glass rod, the *Schmelz*, into the mold and the piercer, who had screwed the needle into a hand vice, knew exactly how long to wait for the precise moment when the presser pressed the mold together, to pierce with the needle at the same time. This cooperation demanded considerable skill of both workers. To make sure the needle pierced in the right place, a so-called "snout" was attached to the mold. It is astonishing that it was possible to make up to 20 or 25 bundles, that is 24,000 to 30,000 single beads, a day in this complicated manner (Labau n.d.).

The mandrel-pressed bead, the so-called *Dörnel*, could be made by a single worker, however. When glass-pressing tongs with mandrel-bead molds were used, the perforation

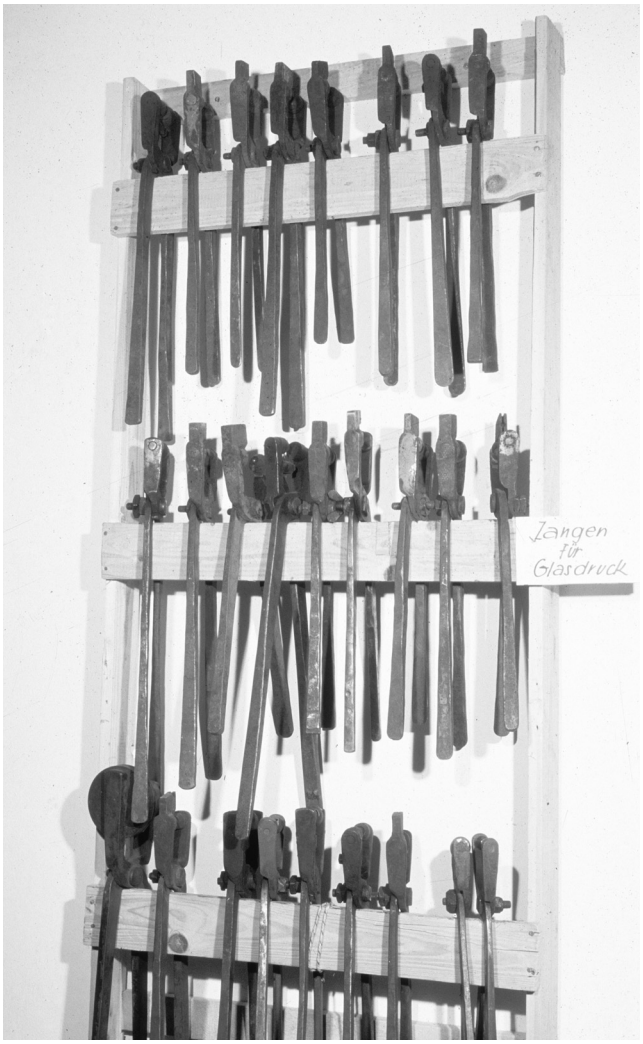


Figure 77. Press-molding tongs from various Neugablonz companies, 1948 (Neugablonz Industry and Jewelry Museum, Kaufbeuren-Neugablonz).

did not pierce the whole glass bead. The mandrel, a conical brass rod, was fixed in the upper part of the bead mold; there was a corresponding indentation in the lower half (Glasdrückerei Labau n.d.). Mandrel-pressed beads have been preserved both in Vienna (from the Biedermeier period) and in the Gablonz Museum (from the late 19th century) which still show the extruded flash before being cut off (Plates 19A-B).

According to Posselt, it took one person to mold the round molded beads; for the laurel berries (elongated beads) two people were required: a molder and a piercer.

> The molded bead was round and the facets still had to be cut.... In the years between 1860-1880, many molded beads were made in all kinds of glass and the facets were molded into them at the same

time; they only needed to be ground over (Posselt 1907:15).

The first glass molding works in Labau were built in 1857, by Joachim Wenzel and Josef Klinger. Beginning in 1868, there were also molding-piercing machines (Labau n.d.). For "molding or squeezing work," rods of many colors, from 10 to 35 mm diameter and about a meter long, were used along with iron and brass molds (Karmarsch-Heeren 1880, 4:52). There were two types of "kernel molding machines:" top piercers and side piercers (Parkert 1925:185). Exchangeable "caps" (*Kappel*) to insert into the molding tongs made it possible to create a great variety of bead shapes (Figures 78-79). After molding, the flash (the ridge of excess glass that extrudes from the seams of the mold) is removed in shaking-sacks. Smooth polishing was done in drums with quartz sand or by tumbling (Figure 80). The resulting mat beads were polished, either on poplar-wood discs with rotten stone (*Trippel*) or by fire polishing (Parkert 1925:188). "Smooth tumbling" without sand, but with water ("water polishing") was also possible (Glasdrückerei Labau n.d.). Some of the steps in making mold-pressed beads are illustrated in Figures 81-83 and Plate 18D.

Figure 78. "Cap table," Neugablonz, around 1948-1949 (Neugablonz Industry and Jewelry Museum, Kaufbeuren-Neugablonz).

The work in the molding hut is known to us from contemporary photographs (Figures 84-88) and from preserved inventories. Specialized literature shows illustrations of molding tongs and machines (Figures 89-96). Beyond that, we also know a number of privileges from which the complicated mechanisms of various types of tongs emerged (Figures 97-99). In 1883, Josef Fischer of Tannwald received a privilege for tongs "for making molded glass beads and stones in all shapes, sizes, and colors with two holes in the shape of a cross." Franz Hiebel of Friedrichswald submitted a process in 1884, which was only partially accepted in 1889 (Figure 95) to make a "cylindrical hole of the same width from beginning to end, pressed through the glass beads molded with these tongs." In 1893, Theodor Hübel, Gablonz a. N., invented mold-pressing with tongs whereby the glass bead was threaded onto wire at the same time (Figure 93).

Adolf Glaser, mold-maker in Schwäbisch-Gmünd, preserves old tongs, some of which were made by his father (Figures 100-101). They are tongs for lamp or furnace pressing: one pair of tongs for lamp-pressing eardrops (Figure 100e); one pair of tongs with a spring for lamp pressing, as a side-piercer also for lamp work, sometimes called an "after-piercer" mold because the needle pierces after the molding (Figure 100a); one pair of tongs for lamp pressing, as a side-piercer all the way through, the upper cap having a moveable part (pattern) – with this method there is less flash and trimming is superfluous (Figure 100c); one pair of tongs for furnace pressing, pressing through the interior part so that it is more easily removed (Figure 100d); one pair of tongs for lamp-pressing, with top-piercer (the design is a faceted pendant) – it is not pierced completely through, since the nickel mold would wear out too soon (Figure 100b); one pair of tongs for lamp-pressing, top-piercer (faceted heart) (Figure 100f). The molds created by Adolf Glaser for making caps (Figures 102-103) are fine mechanical masterpieces in their precision, a prerequisite for flawless work by a press-molder.

Pressing

The mechanical process of pressing powdered clay and silica components in a mold and then firing the resultant objects to fuse the material was first patented in London by Robert Prosser in 1840 (Sprague 1983:168). The items to be produced included "knobs, rings, and other articles." Whether the "other articles" included beads is not known.

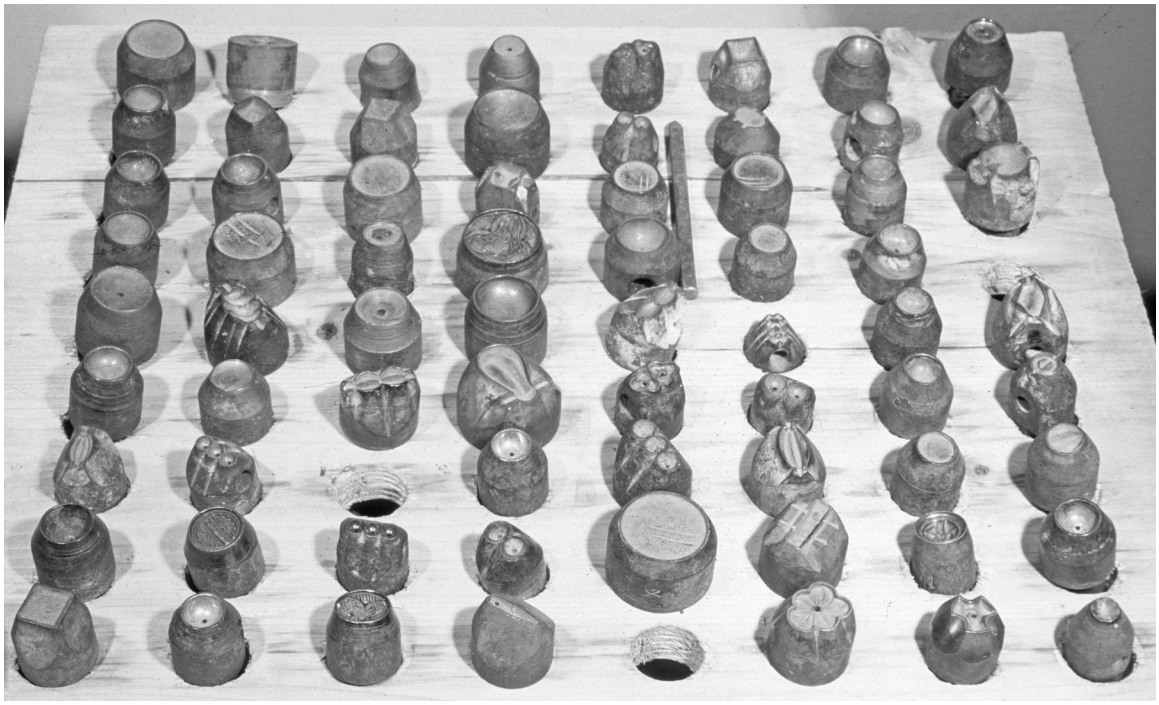


Figure 79. "Caps" from the "cap table" (Figure 78).

For beads, the production methods of Jean Felix Bapterosses are the best known. In 1880, he had a process for "an improvement in the production of buttons, beads, and other similar articles made of ceramic paste" protected in Austria (Figure 98). In 1887, Walldorf & Co. in Gablonz developed a "method and apparatus for pressing beads from plastic substances" (Figure 97), and Albrecht Max received a privilege in 1888 for his "continuous functioning button & bead press" for "pressing clay and other plastic substances by mechanical means" (Figure 99). In addition

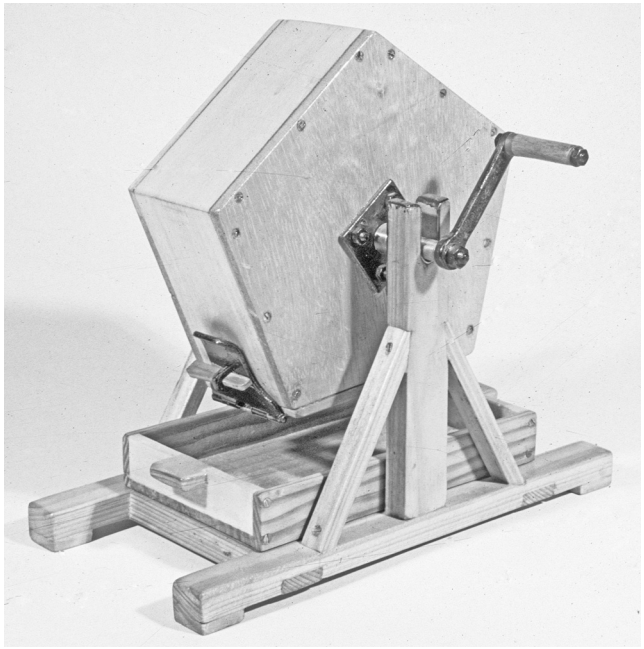


Figure 80. Model of a "tumbling drum," Neugablonz (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

Figure 81. Erna Kleinert sorting beads, Neugablonz, around 1975.

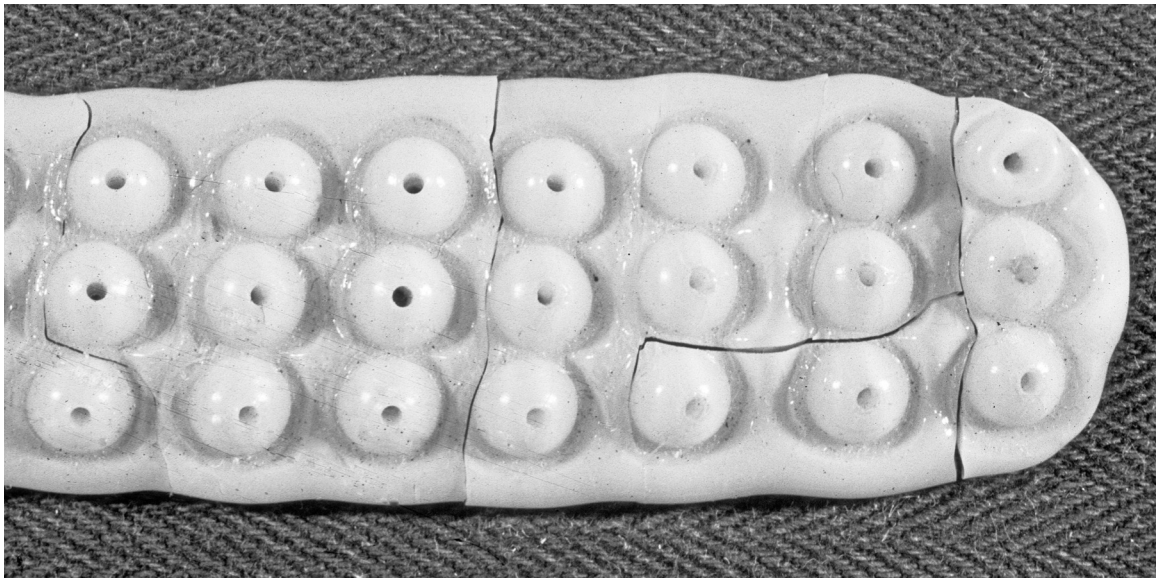


Figure 82. "Three-tiered pressing" made in a glass-pressing house, Heinz Kleinert, Neugablonz, about 1977 (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

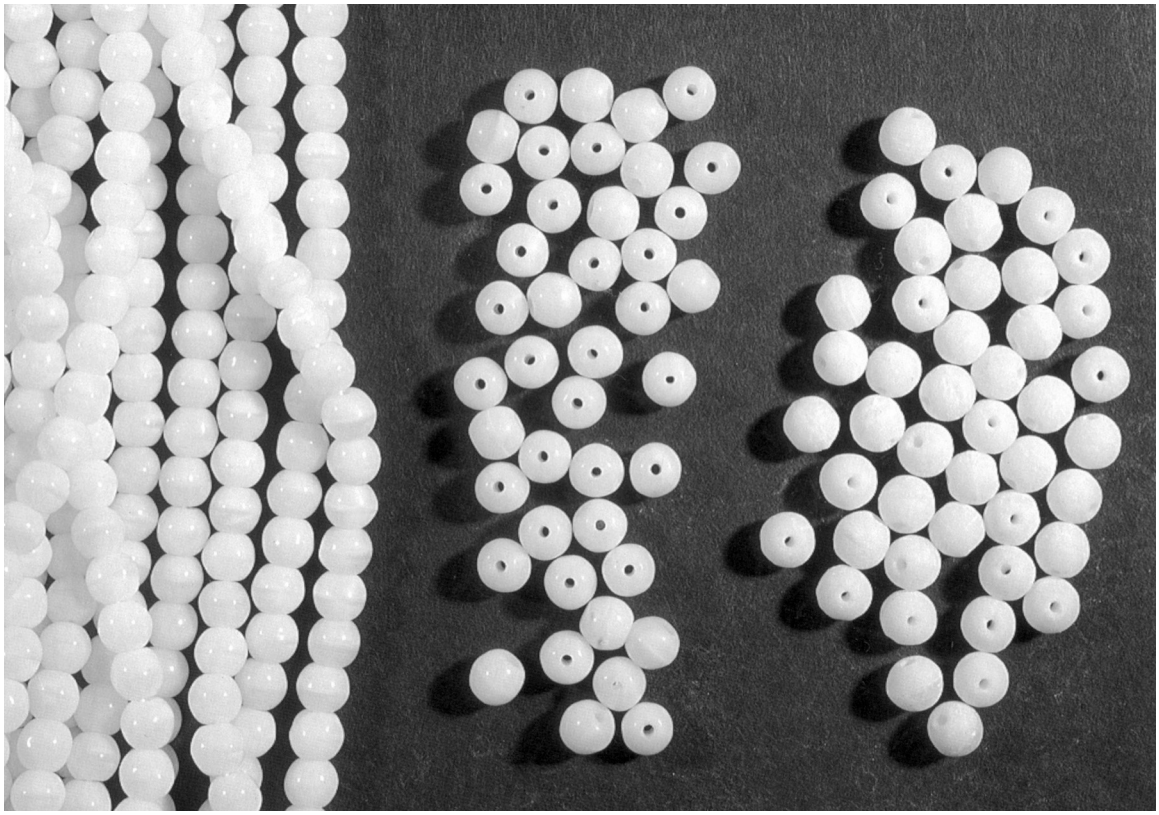


Figure 83. Stages in the manufacture of pressed beads (cf. Figure 82). From right to left: tumbled, polished, and strung beads; Heinz Kleinert, Neugablonz, 1977 (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

to Bapterosses, other foreign companies also received the protection of an Austrian privilege, such as the company Neumann/Buchholz in Saxony in 1888, for a "machine for producing beads of Bohemian glass, clay, faience, majolica,

Figure 84. Glass press-molder at work, probably early 20th century (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

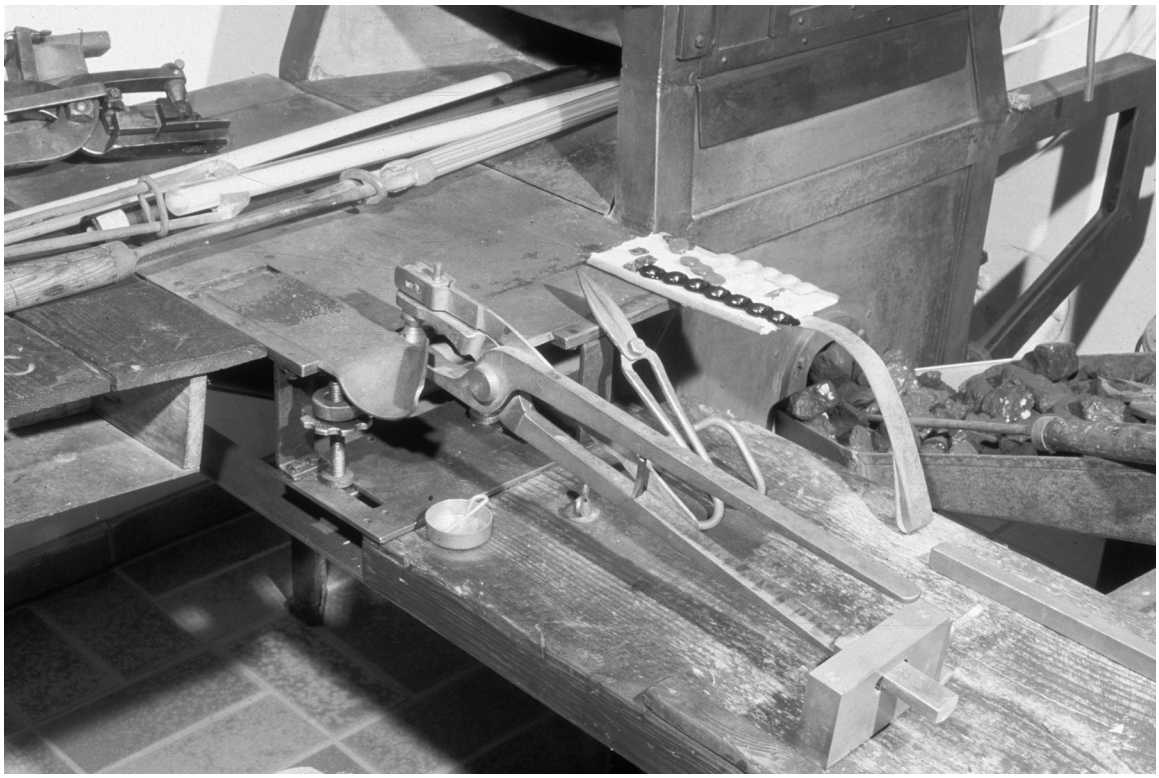


Figure 85. Work station at a press-molding factory (furnace, molding tongs).

Figure 86. Press-molding work station (coal-fired furnace), Neugablonz, around 1947, with contemporary photograph (Neugablonz Industry and Jewelry Museum, Kaufbeuren-Neugablonz).

and other substances in all formats." The Redlhammer Brothers in Gablonz were the first firm to introduce the Bapterosses beads into Bohemia. The collection of sample cards in the Technical Museum in Vienna is an unparalleled inventory.

Parkert deals with the production of porcelain beads in detail. He also writes of the "earthenware bead" and differentiates between the basic materials used:

> ... agate or stone and strass substances. The former consists as a rule of a mixture of fine washed

Figure 87. Heinz Kleinert at his press-molding work station around 1975 (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

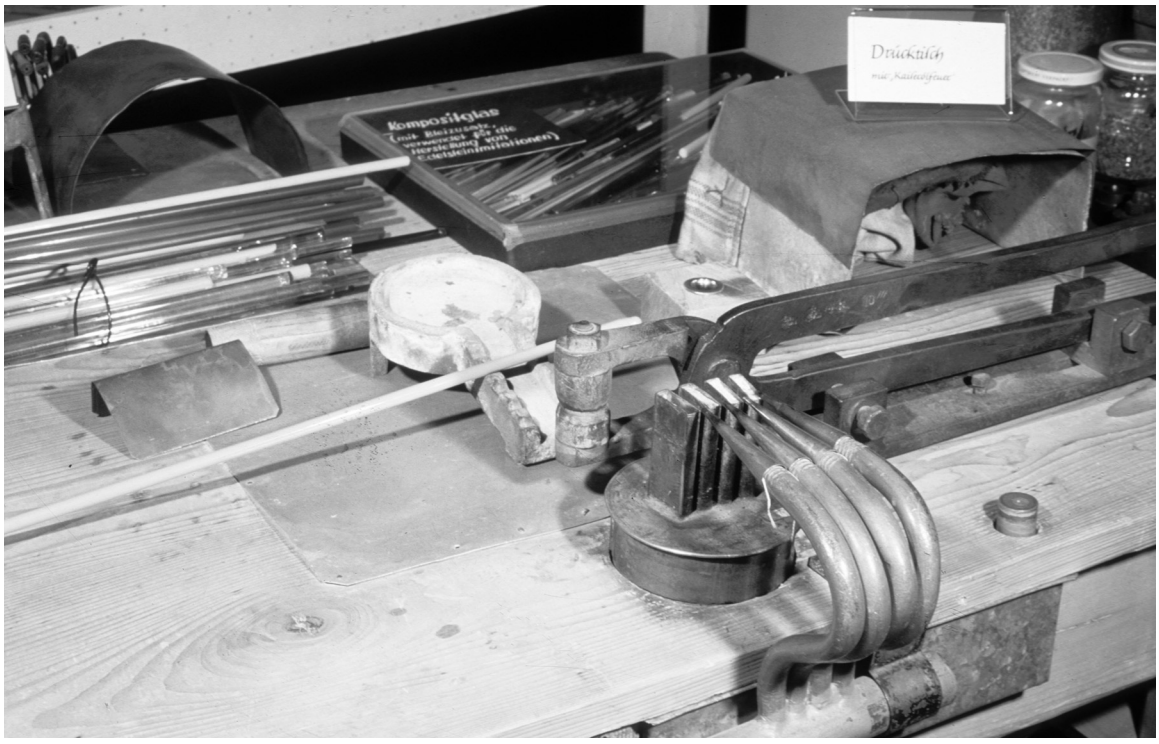


Figure 88. Lamp-pressing work station (using kerosene), Neugablonz, around 1947 (Neugablonz Industry and Jewelry Museum, Kaufbeuren-Neugablonz).

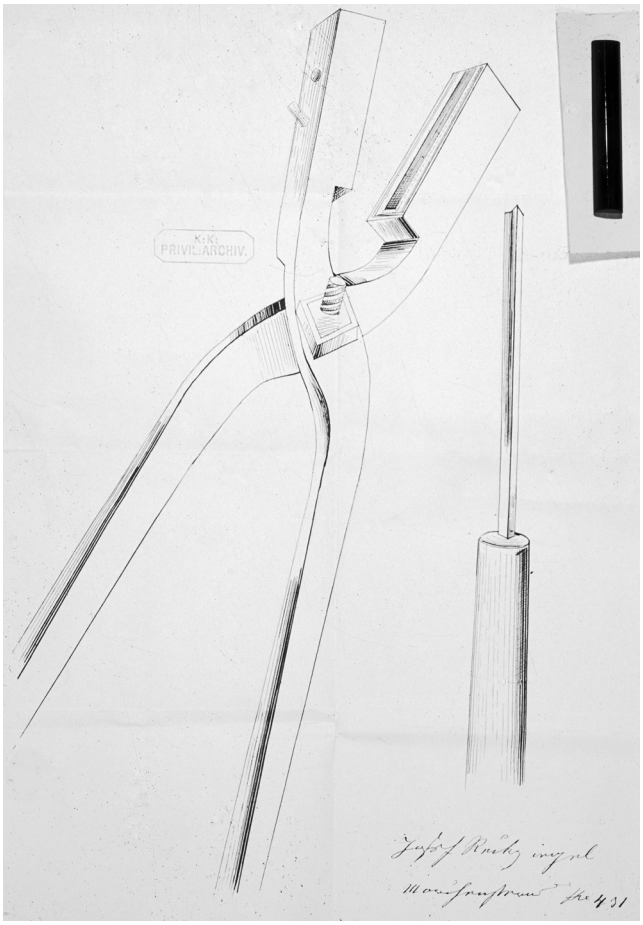


Figure 89. An improvement in attaching the metal backings of glass jewelry items, 1878, Josef Reckziegel, Morchenstern, privilege no. 28/321 (Austrian Patent Office).

> feldspar which has been freed of as much iron as possible by treating with acids, and a small amount of phosphoric lime. The strass pastes, on the other hand, consist only of feldspar (Parkert 1925:200).

The pulverized and sifted material (*Massegut*) is mixed with a binder (milk, gum arabic, tragacanth, or a casein-glue solution), stirred to make a homogenous paste, and when necessary, dyed with metal oxides or mineral colors. The paste, rolled out into sheets, is placed in a pressing frame and pressed with a die. A glassy characteristic is aimed at for the basic material; a special glaze is not necessary. Finally, the beads are fired in a muffle kiln (Parkert 1925:201, 202).

Probably situated somewhere between glass and porcelain, these "earthenware beads" are sometimes difficult to assign to one category or the other; their surfaces generally have a glassy appearance. North American researchers refer to these beads as "Prosser Molded" (Karklins 1985:104).

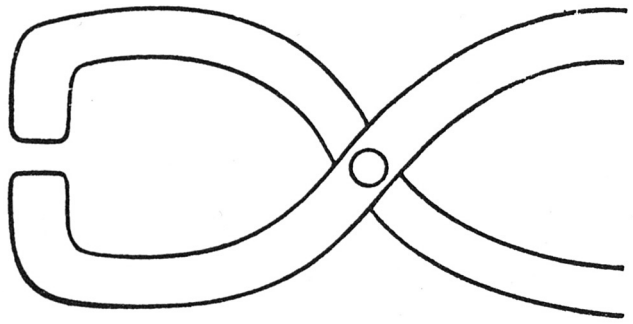


Figure 90. Old molding tongs (Kleinert 1972:37).

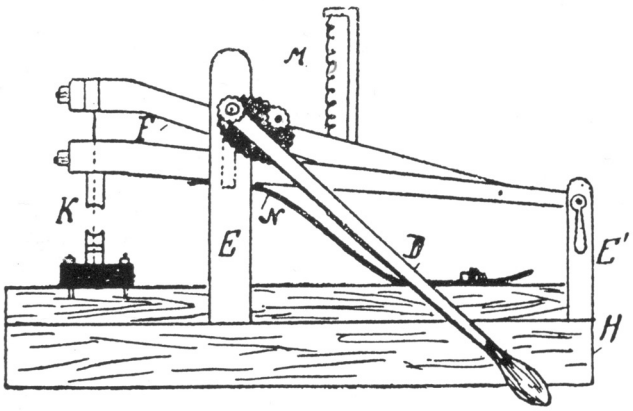


Figure 91. "Körnel pressing machine" (*Körneldruckmaschine*) (Parkert 1925:186).

WOUND BEADS

Drawn beads and wound beads were principally made in Venice and Murano, while "cut beads, bijouterie, artificial gemstones... were made exclusively in Gablonz and in the towns close by" (Jonák 1858:8). Although extremely well known in other regions (such as the Fichtelgebirge), the wound bead (*Wickelperle*) never held a top rank in Bohemia. All the same, a brief mention of the two most important techniques for winding follows: 1) a glass rod heated at the flame of a lamp is wound around a metal rod; sometimes this procedure is combined with molding in molds, and 2) working the molten glass from the pot with an iron rod.

Winding as Lampwork

Solid beads made at the lamp (*perle a lume*) are mentioned by Altmütter: on the one hand, these were beads made from pieces cut from a tube, stuck on a wire, and melted to a round shape at the flame of a blowing table

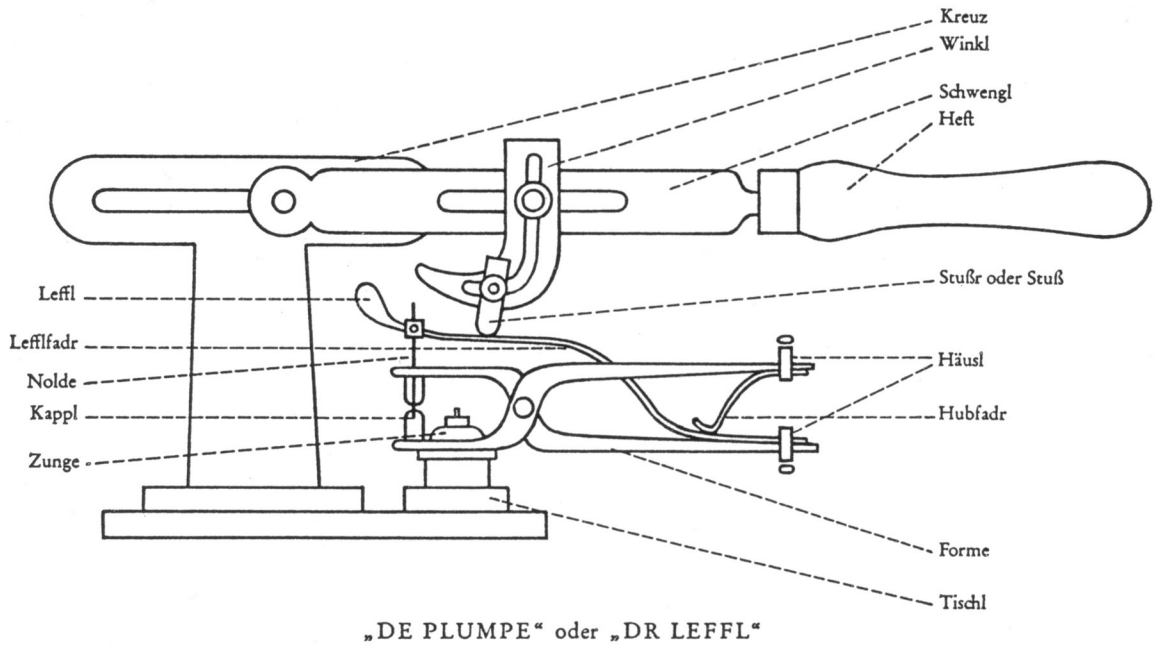


Figure 92. Molding tongs (“de Plumpe” or “dr Leffl”) (Kleinert 1972: Plate 1).

or shaped further. On the other hand, pieces of solid glass canes were softened at the lamp and wound around an iron mandrel or wire and shaped by melting (Plate 20A top); this could also be done with the help of a tong-mold:

> The smaller solid glass beads get their complete shape while they are still soft, namely on the wire by using metal molds.... These beads are made with eight or twelve facets, in imitation of real cut beads; others have little raised lumps and several kinds of simple decoration (Altmütter 1841:101).

The bead worker (*perlajo*) used solid rods and gave his beads the desired shape, color, and decoration with the help of the lamp flame. Bussolin replaced the flame fed by melted tallow with a gas flame (privilege 1843). Despite the numerous advantages (more brilliant colors, especially in the gold-colored red, larger products, and moderate costs), this technique did not become widespread immediately (Bussolin 1845:28). The evidence of “winding” can still clearly be seen on wound beads of the early 19th century (Plate 20B top). The oval, spherical, or disc-shaped beads glow in many colors, sometimes with streams of sparkling, golden aventurine glass running through them.

In Venice the *perlaires* worked in their own workshops. The lampworkers held the glass rod in their right hand and in the left, an iron wire coated with a mixture of glue, lime, and white earth (*terre blanche* or *terra bianca*) from Vicenza. By heating the glass rod and winding it around the iron wire, the worker could give the bead any shape desired, either free-hand through motion or by using small molds (Bussolin 1847:8, 29). Zanetti describes the same procedure and mentions small bronze molds. The Venetian *perlejo* (also *suppialume* or bead blower) created an almost infinite variety of beads (Zanetti 1874:135, 136). According to Parkert (1925:139), hollow copper wire was also used for making hand-wound beads. The wire was later removed by dissolving it in nitric acid. At the German-Bohemian Exhibition in Reichenberg, two groups of wound glasswares could be seen:

> After being softened in the flame, the wound glass is either pressed in molds (lamp molding) or wound.... Among the wound articles, special mention should be made of the wild animal eyes. Also, one sees sphere and link chains, turned prisms, hat and cravat pinheads, some wound right onto the wire” (Arnold 1909:90).

We can admire both of these techniques today in the workshop of Josef Mantel, Senior and Junior: beads and stones (Plates 15D, 20B bottom). The stages of the so-called “lamp molding” process are shown in three detailed photographs (Figure 104). Earlier workplaces used by lamp winders are preserved today in the museum in Neugablonz (Figures 105-106). It was also possible to use machines for winding beads (Figure 107); only a few years ago, beads were still wound by Kratzmann in Enns (Upper Austria) with the help of a machine specially constructed for this purpose (Plate 20A bottom).

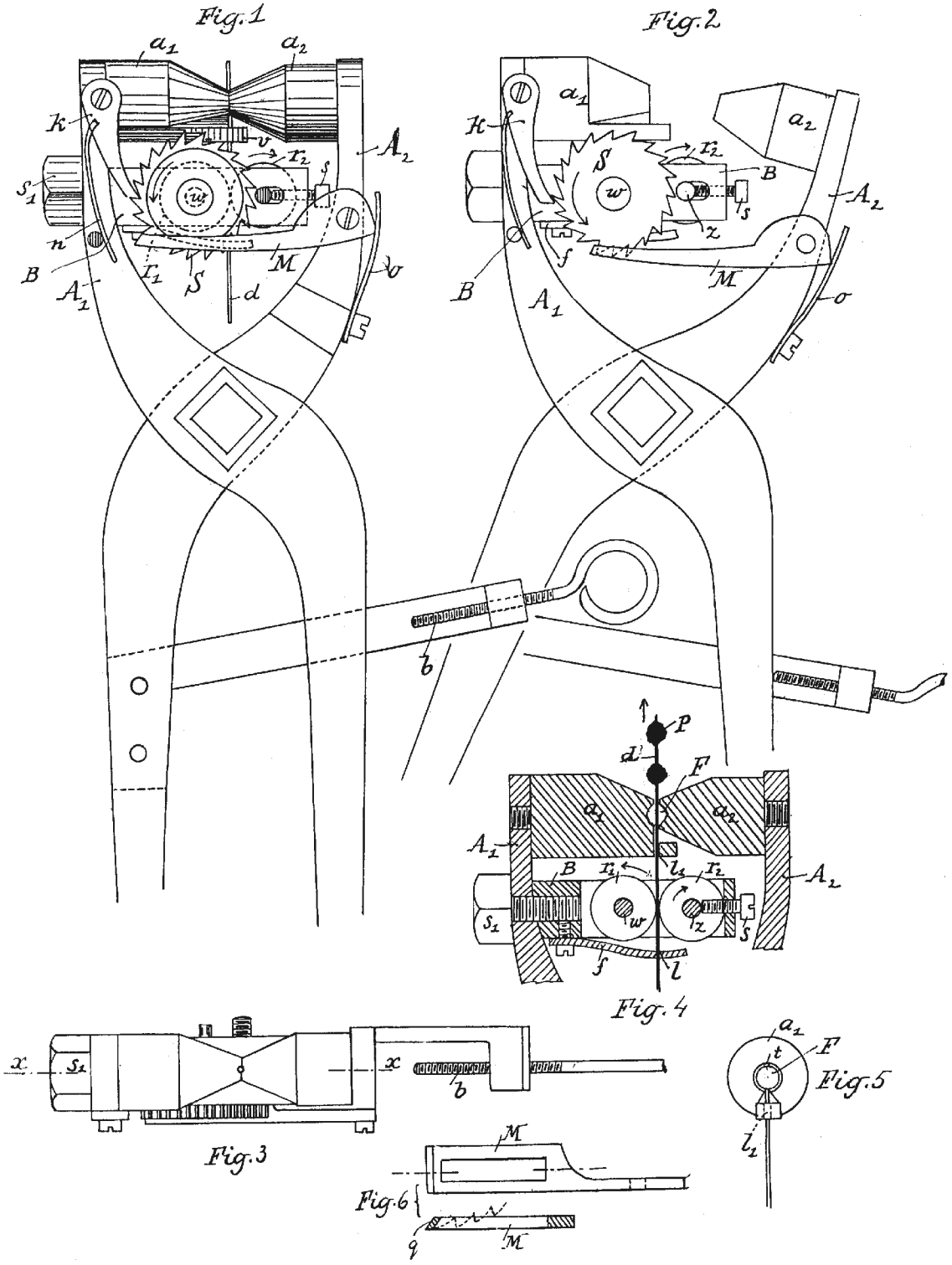


Figure 93. Tongs for pressing glass beads on wire, 1893, Theodor Hübel, Gablonz, privilege no. 43/4069 (Austrian Patent Office).

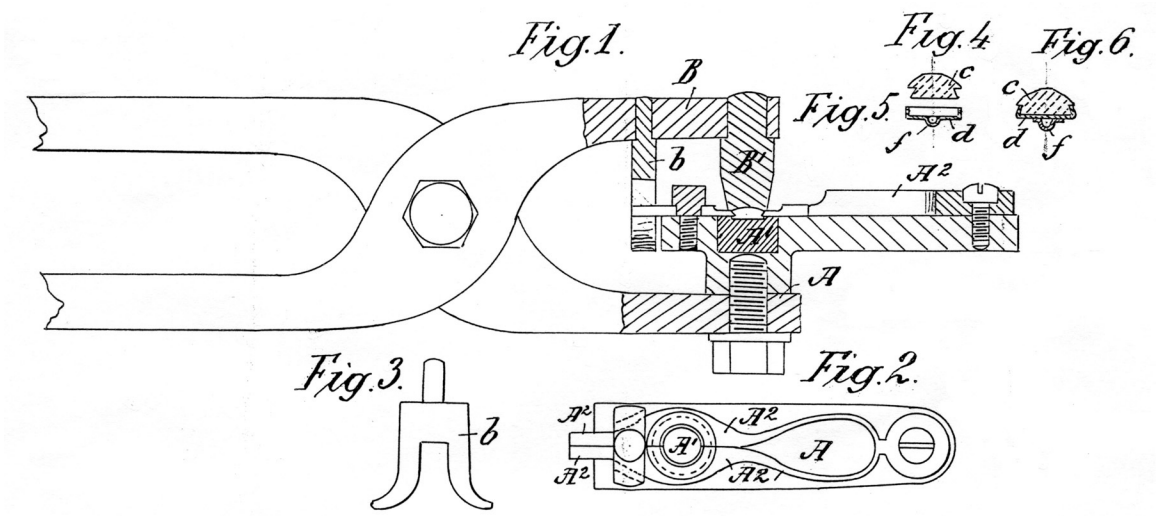


Figure 94. Molding tongs for making buttons, 1897, Franz Bergmann, Gablonz, 1897, privilege no. 47/3309 (Austrian Patent Office).

Winding from the Pot

According to Parkert, wound beads were already made in Germany in the 16th century. The winding iron (a piece of wire) was dipped into a mixture of powdered clay and lime, then into a crucible filled with molten glass and the beads shaped by a round wooden mold.... Later a so-called "form cutter" (*Formstecher*) was used,

> ... whereby it was possible to extract three or more beads at one time from the molten glass.... The

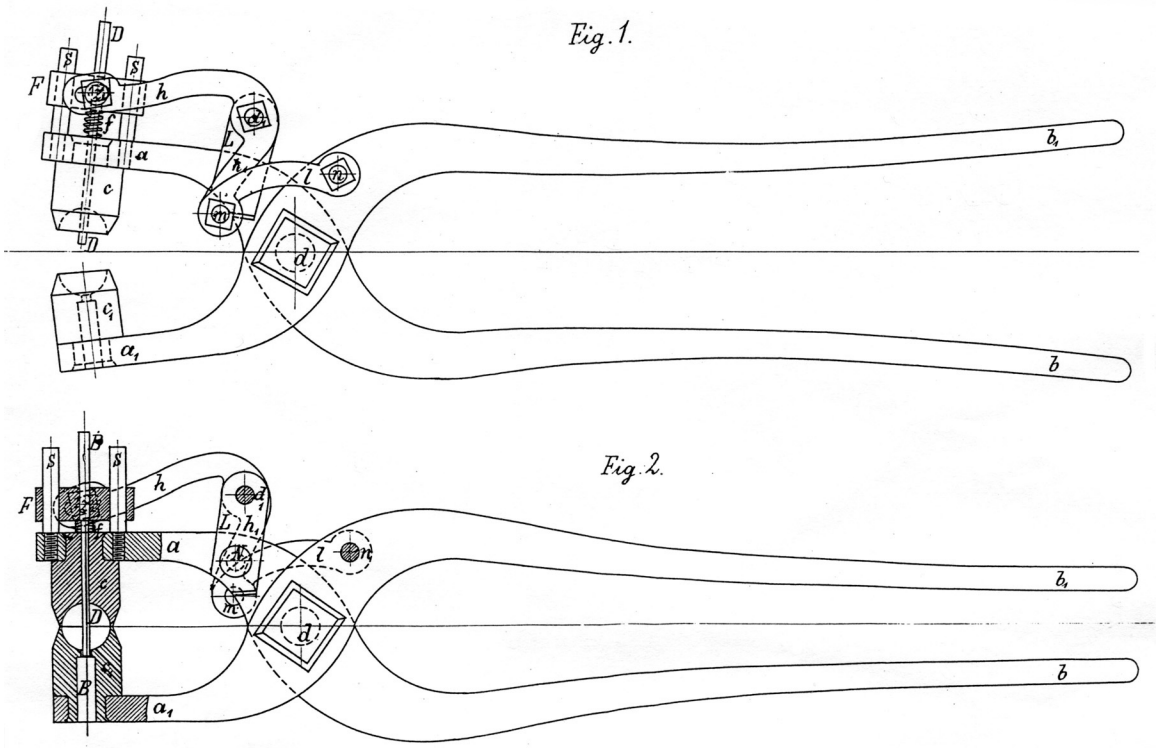


Figure 95. Tongs for making pressed-glass beads, 1884, Franz Hiebel, locksmith in Friedrichswald, privilege no. 34/1872 (Austrian Patent Office, Vienna).

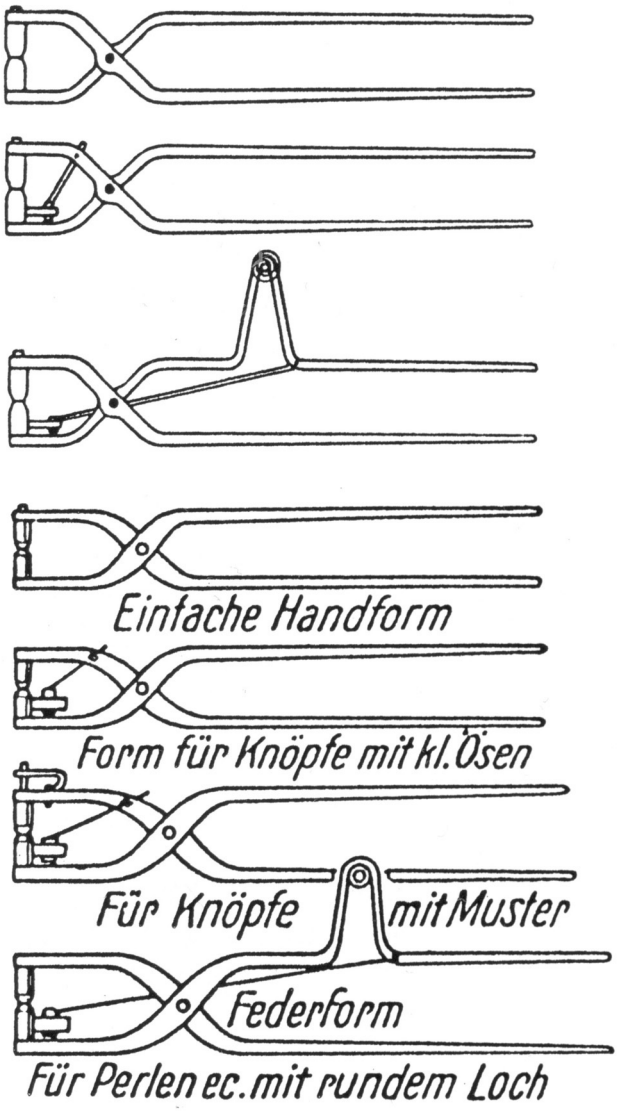


Figure 96. Seven tongs for press-molding beads and buttons (Hannich 1931:59, 73).

> wound bead came into fashion recently, and today it plays an important role, even in France.... A device was patented by M. Bonnet for making wound beads by machine using the principle of glass spinning (Parkert 1925:137, 138).

Leng (1835:504) explains the technique of winding, using a glass button as an example:

> The worker sits at the crucible and dips the eye of the wire into the liquid glass, turns it around inside, making the lump of glass hanging from it round and then throws the button into a pot standing nearby where it gradually cools.

Wound beads, according to Graeger (1868:120), were made on an iron rod with a conical point. First the worker dipped the rod into soft clay, then into a pot with liquid glass. Holding the rod upright, he turned it on its axis until the glass had taken on a round shape. After cooling, the beads were sifted, shaken, rinsed, washed, dried, and polished in sacks with bran. Benrath (1875:351) provides a similar description of making the "wound" bead, although he points to Theophilus (n.d., 2:31).

BLOWN BEADS

Included in the "*lavori alla lucerna*" (lampwork), along with the technique of winding which was practiced in Venice and Murano, there was also the blowing of the hollow glass bead at the flame of a lamp, as mentioned in Kunckel's (1756) *Ars Vitraria*. Was Andrea Vidaore (also found as Viadora, Viaodore, Vidaora) from the 16th century really the first person to know how to blow round beads from hollow glass tubes? According to Bussolin (1847:53, 54), he founded the art of the *perlaire* (earlier *suppialume*). His technique spread rapidly, especially in France where Jacquin, the Parisian *petenôtrier* ("paternoster maker"), first put hollow glass beads with silver essence made from fish scales on the market. The pearl essence (*Essence d'Orient*) gave the glass bead the silky shimmer of real pearls (Loth 1859:72). Diderot's *Encyclopaedia* already shows illustrations of the making of false pearls (*perles fausses*): the scales of the whitefish, sucking in the solution and blowing it into a bead, filling it with wax, inserting a little roll of paper into the bead so that it could be threaded later (Diderot and d'Alembert 1772: Plates I-III). Later on, machines performed this task (Figures 109-111).

The production of hollow glass beads spread quickly in Bohemia, Austria, and Germany (Parkert 1925:152). Blown beads were mostly made in Venice, Bohemia, Pest, and Vienna. The Venetian beads were offered "in 15 different numbers, in all shapes and colors;" Bohemian glass spinners and glassblowers were found in Turnau, Liebenau, and other places; Grainer in Pest produced "various blown glasswares" (Keess 1823:904). A large number of blown beads made by Anton Schwefel are preserved in the Technical Museum in Vienna (Plate 21B). "Wax beads" are nothing other than hollow beads whose pearly shimmer is achieved by inserting "pearl material" (pearl essence) into the bead. The extremely thin, hollow glass bead was fortified with a wax filling which acquired a reddish or yellowish sheen from cinnabar or a yellow pigment (e.g., curcuma) (Keess 1823:902). "Ordinary, medium, and fine varieties" were sold in strands, with a strand of the smallest beads holding 100 to 150 pieces, the medium sized beads 50, the large 30

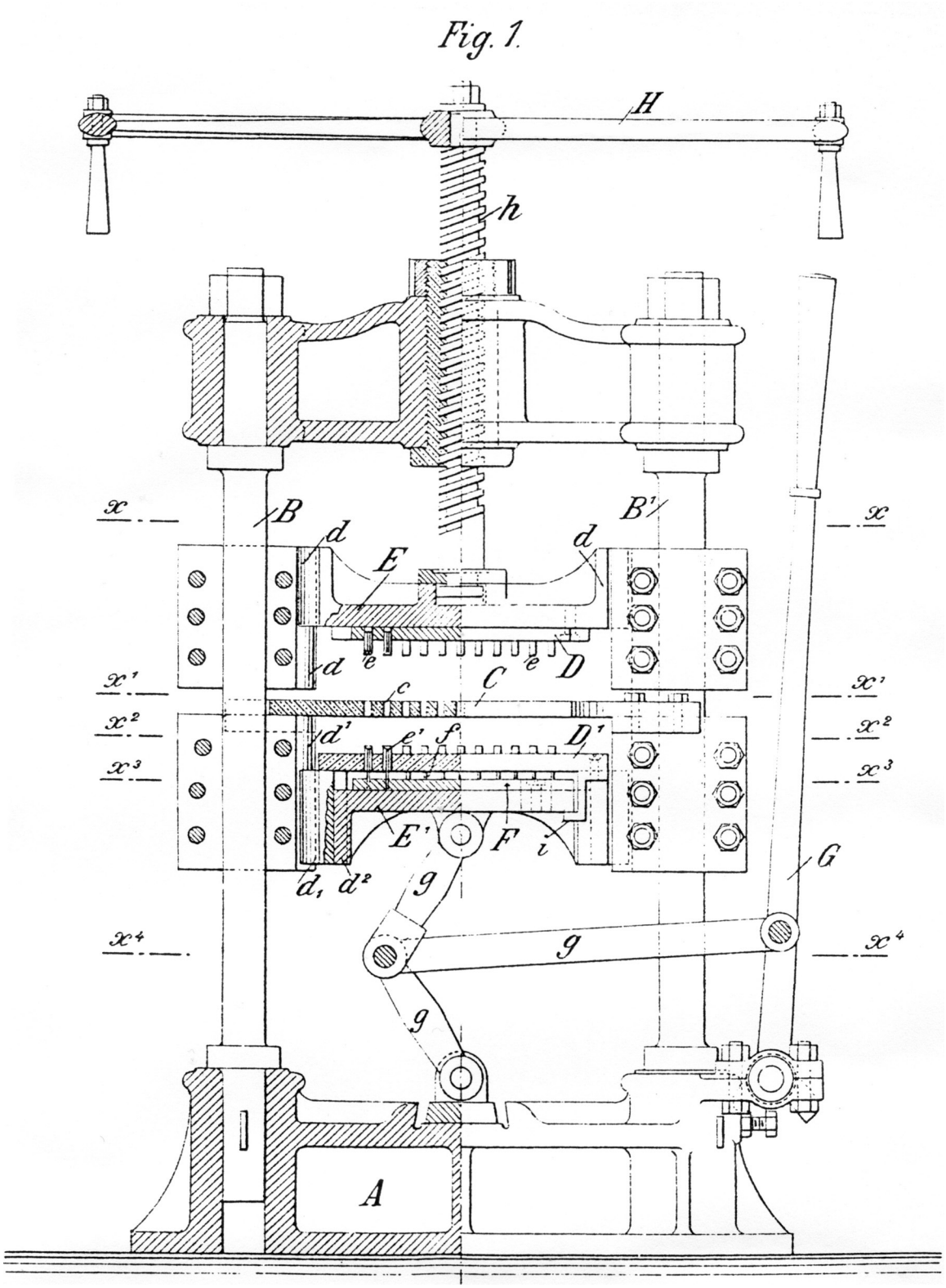


Figure 97a. Method and apparatus for pressing beads of pliable substances (Part 1), 1887, Walldorf & Co., Gablonz, privilege no. 37/1292 (Austrian Patent Office).

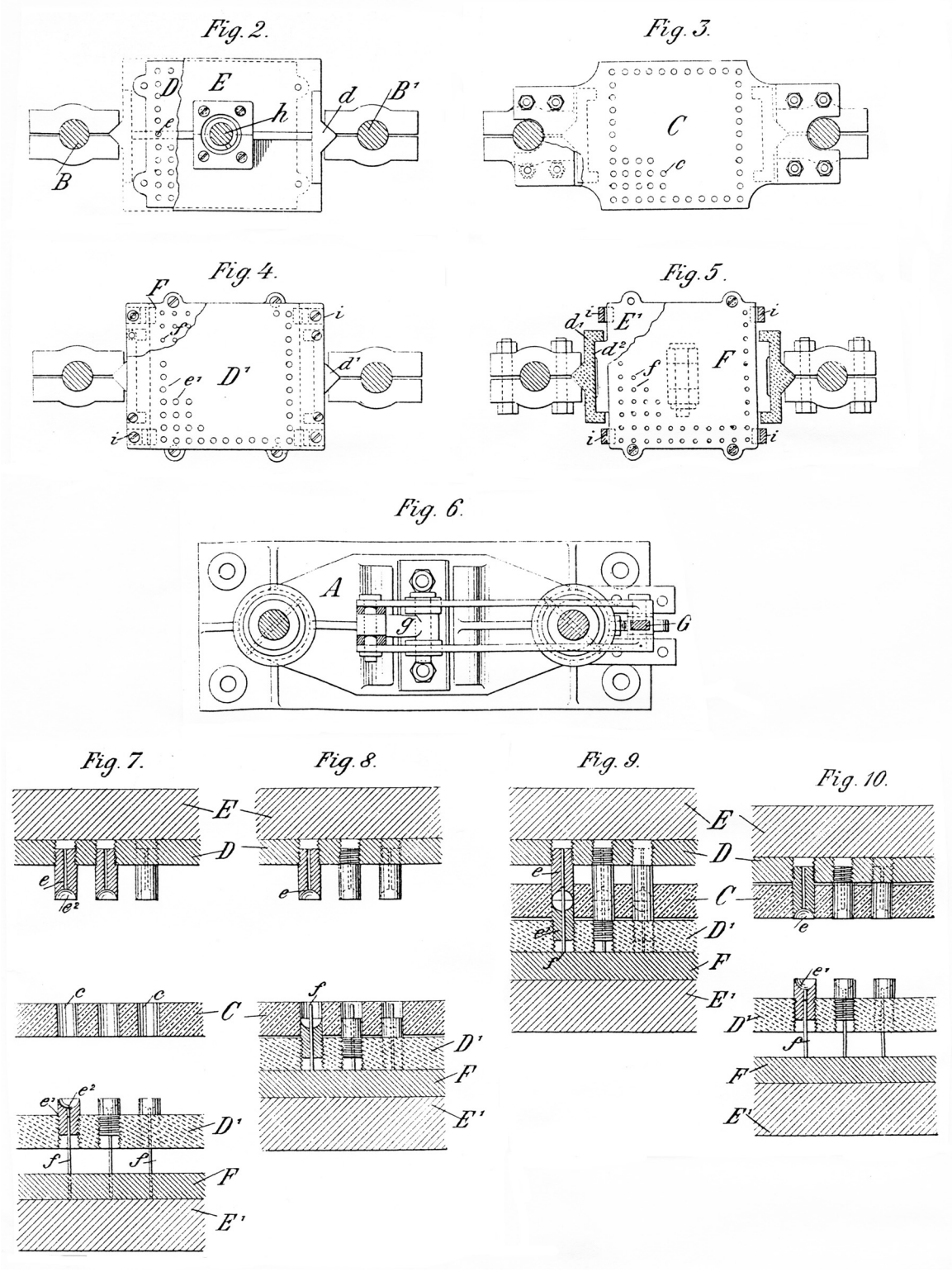


Figure 97b. Method and apparatus for pressing beads of pliable substances (Part 2).

to 50. The production of artificial pearls was supposed to have been introduced to Vienna by immigrant Frenchmen in 1787. The Viennese "artificial pearl manufacturers," Joh. Keimel, Anton Schwefel, and Ant. Birgmayer, among

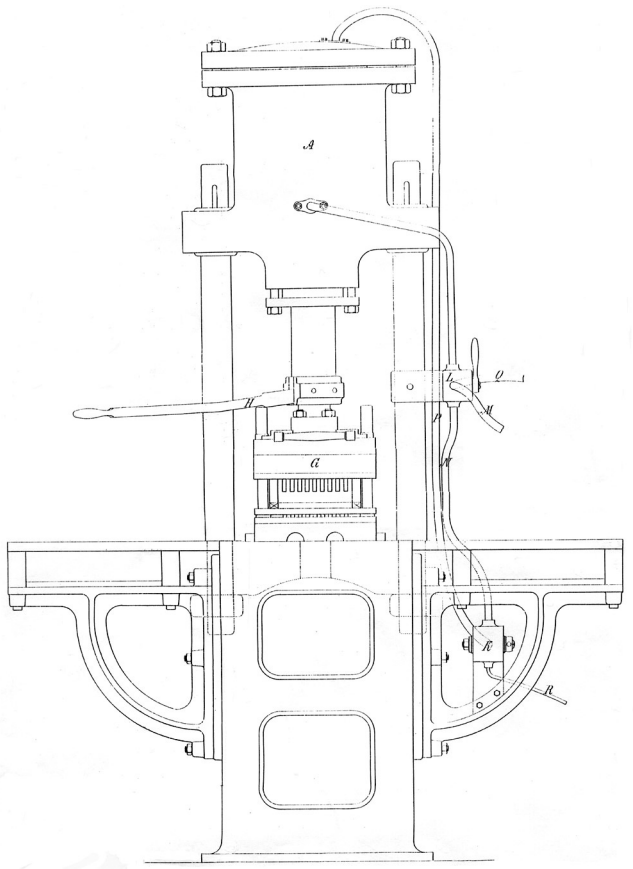


Figure 98. A hydraulic pressing system for manufacturing buttons, beads, and other similar objects made from ceramic materials, 1880, J.F. Bapterosses, privilege no. 30/953 (Austrian Patent Office, Vienna).

others, were known for their "very excellent" wares. In 1822, a dozen strands of ordinary Viennese glass wax pearls (in two sorts) cost 1½ to 2 fl., the medium-fine wares 5 to 7 fl., and the fine wares 20 to 24 fl. (Keess 1823:905).

There is no doubt that the Gablonz hollow-glass bead experienced a high point in the Biedermeier period. The most beautiful beads and bead necklaces of that period are now found in the collection of the Technical Museum in Vienna (Plates 21D-24B). The wealth of shapes, colors, and decoration was inexhaustible.

> Most beads are made round, but there are also pressed shapes, oval, cylindrical, almond shaped, angular, those wound like scrolls, etc. The so-called craw or baroque pearls (*Kropf-perlen*) are given little outgrowths to make them look more like the natural ones;... (Leng 1835:501).
>
> Finally there are also figured beads, for example, those with a belt of raised knobs, with melon-shaped grooves, leaves and other simple decorations which achieve their fully developed shape in two-part molds.... The molds are used thus: the little spheres, blown to almost their desired size, are put into the molds while still hot; air is blown into the tube on which the sphere is still fastened and the tongs closed at the same time. The design is shaped by the pressure of the air being blown in and the pressure of the soft glass against the depressions on the sides of the mold... (Altmütter 1841:90).

Beads with irregular shapes were usually known by the illustrative term craw (*Kropf*) bead or baroque pearl. Imitating the genuine baroque or "lumpy" pearls was achieved by touching the glass bead with the flame and blowing air into it at the same time; this caused the walls to swell out at these particular places and little raised places became visible "which imitate those lumpy parts" (Loysel 1818:307). Craw beads or pearls also resulted when the glassblower at the lamp touched the bead with the end of a red-hot glass tube and pulled outwards (Keess 1823:901; also Leng 1835:501).

The art of blowing beads was brought to Gablonz by "people from Turnau who worked in Venice or by Venetian workers who settled in Turnau" and Endler in Gablonz was supposed to have learned the technique from them. The oldest-known Gablonz beadblowers were Joachim Hemrich, Anton Scheibler, Franz Wawersich, Josef Scheibler, Anton and Anastas Seidel, and Anton Appelt, among others.

> In the beginning only round beads were produced. They were made of ruby-colored composition that was "painted" inside with cinnabar to give them the color of corals. Later "pears," acorns, olives, laurel berries, etc., were also made of hollow composition canes at the flame of the lamp; they were no longer restricted to the coral color, but these variously named wares were made in all colors. They were decorated by etching, silvering, lustering, and gilding. Beadblowing spread from Gablonz into the mountains, to Morchenstern, Josefsthal, Maxdorf, etc. (Benda 1877:165, 166).

According to Lilie (1895:165, 166), "the relatives of the glassmakers who Elias Zenkner brought here from his home country... were the first to make these beads."

The artistically wrought "lamp" of Diderot (Diderot and d'Alembert 1772: Plates I-III) or the one belonging to Anton Schwefel stand apart from those which were often simply made of primitive tin cans (Figure 16) but still managed to serve their purpose. Fed with oil or tallow in the beginning, later with "imperial oil" (refined petroleum), these "lamps" were still being used in the Bohemian region at a time when better equipment, such as gas burners and

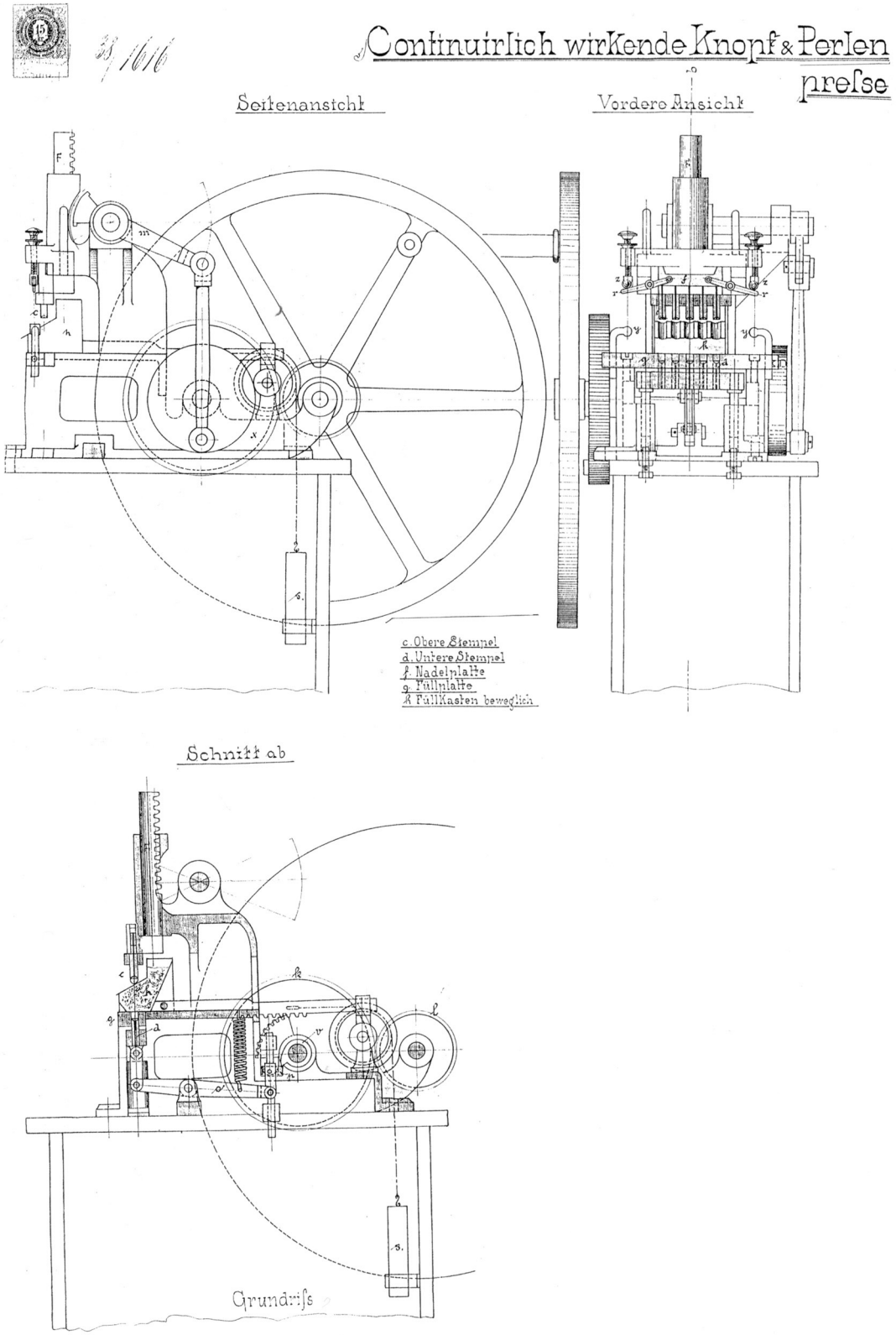


Figure 99. Button and bead press, 1888, Albrecht Max, Reichenberg, privilege no. 38/1616 (Austrian Patent Office, Vienna).

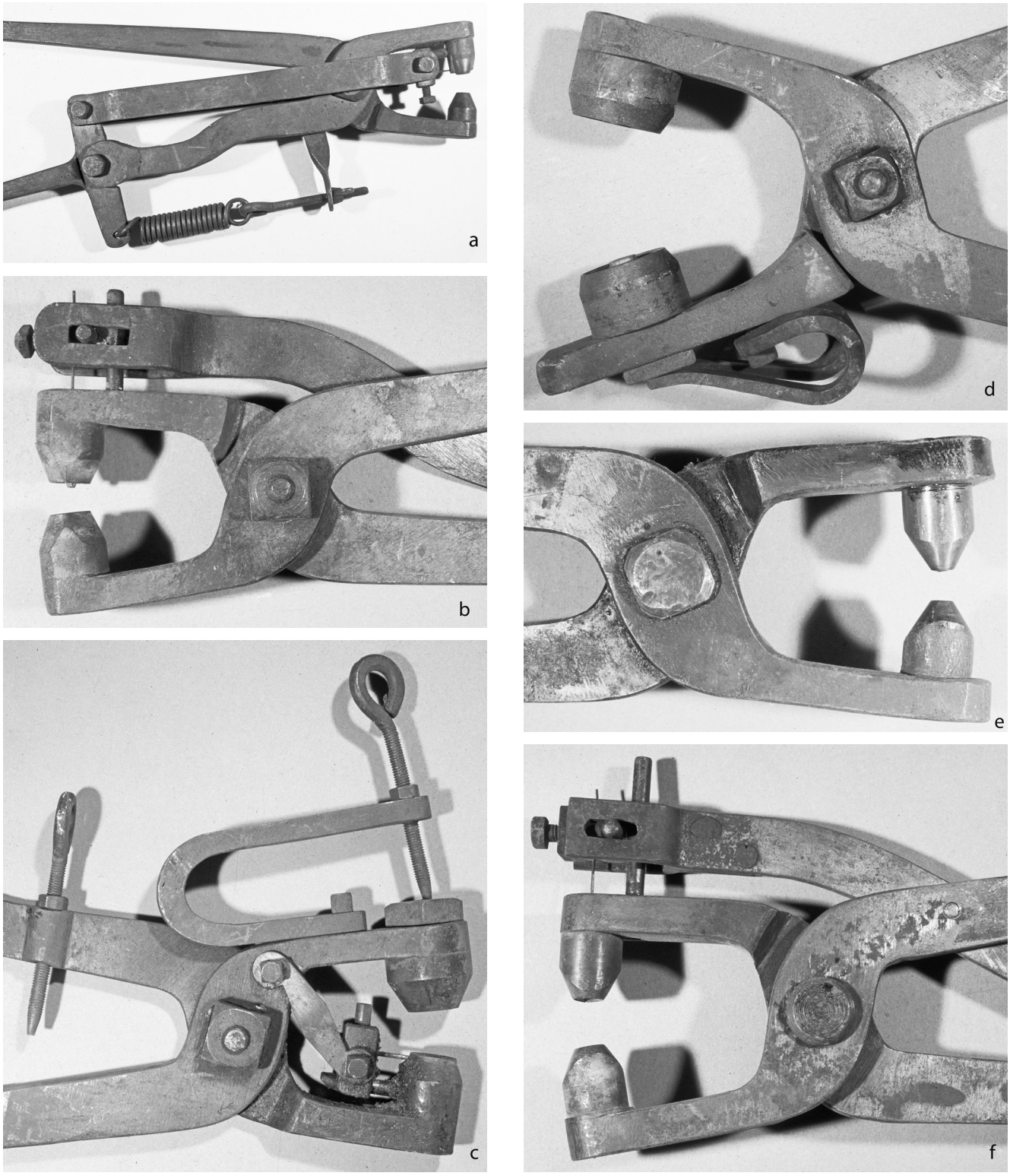


Figure 100. Details of glass-molding tongs for lamp and furnace pressing (Adolf Glaser, mold-smith, Schwäbisch-Gmünd).

compressors, had long been available. Towards the end of the 19th century, the "blowing table" (with a bellows) was in general use (Lilie 1895:165, 166) (Figures 14, 112). The beads were made separately, blown free-hand or in

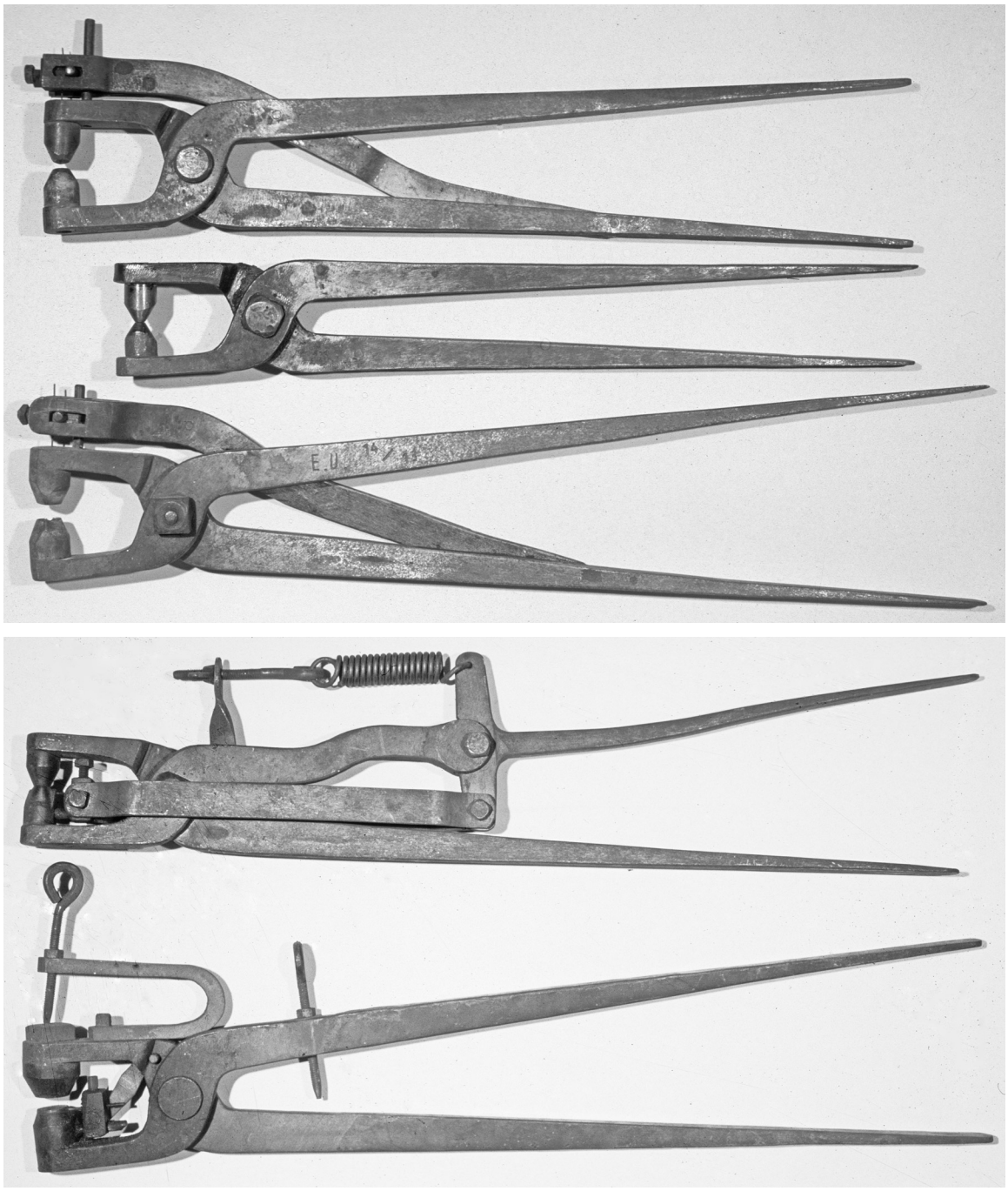


Figure 101. Glass-pressing tongs for lamp and furnace work (Adolf Glaser, mold-smith, Schwäbisch-Gmünd).

individual molds (Figure 113-114), or were blown in rows of connected beads (*Klautschen*) (Figure 115). They were also made with the bead-shaping machine (Figures 116-117) which was introduced into the Iser Mountains in the 1870s (with a pressure tank attached to the pressing mold). Further improvements were brought by the Jossand method (*Jossand'sche Verfahren*) (Parkert 1925:156) (Figure 118).

Color-lining, silvering, and gilding have already been treated in the chapter on colors and coloring since they were not used exclusively for hollow glass beads (Plate 21A). The so-called gold bead is also mentioned there. Shiny gold-glass beads are defined differently by contemporary authors: generally speaking, the gold bead was a bead made of yellow glass (topaz, amber, or honey colored) lined with

Figure 102. Molds for making “caps” for glass-pressing tongs (Adolf Glaser, mold-smith, Schwäbisch-Gmünd).

Figure 103. Molds for making “caps” for glass-pressing tongs (Adolf Glaser, mold-smith, Schwäbisch-Gmünd).

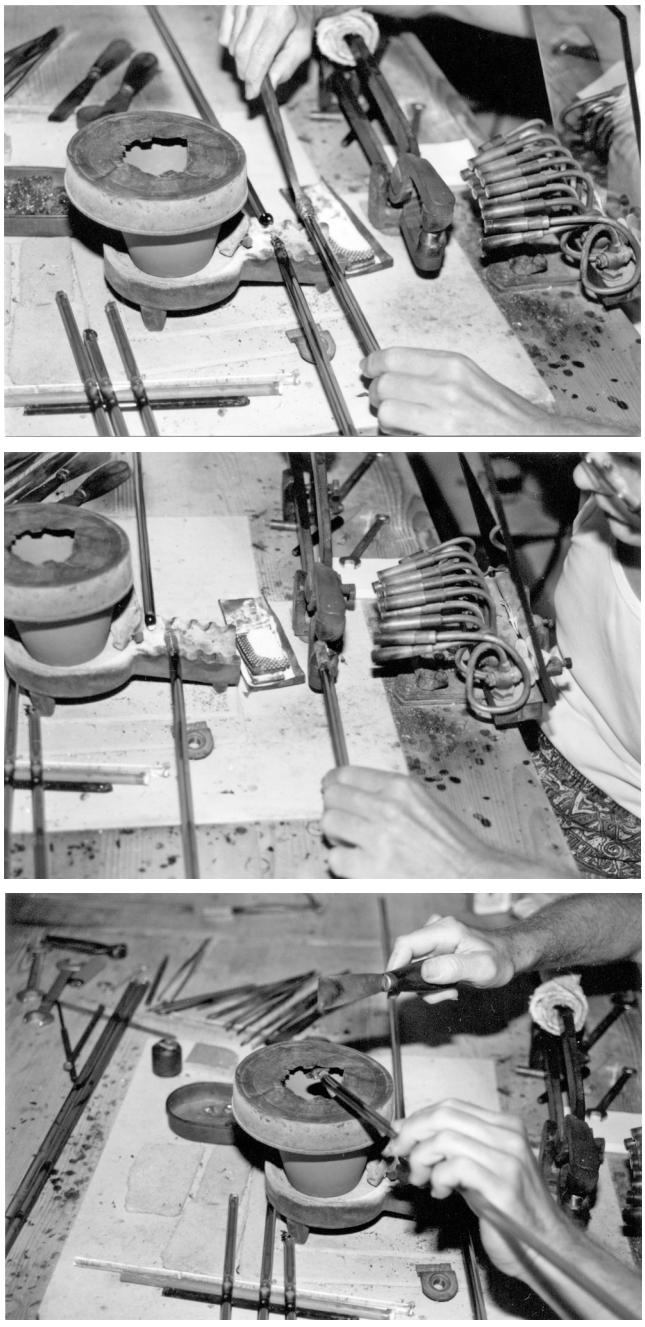


Figure 104. Winding and pressing stones and beads, 1994 (Alfred Mantel Co., Mauerstetten-Steinholz, Germany).

silver (Plate 21C); the real gold bead: crystal glass with a real gold lining. Real gilt hollow beads were only made in Paris up to the beginning of the 1890s (Gablonz 1898:162). On the one hand, the fine gold bead is seen as a bead "made of a specific yellowish glass composition (lead glass)" (Tayenthal 1900:24); on the other hand, as a synonym for the real gold bead by Winter. The sample cards from Weiskopf in Morchenstern are supposed to have shown no less than

Figure 105. "Lamp winder" at work (Neugablonz Industry and Jewelry Museum, Kaufbeuren-Neugablonz).

1,500 different kinds of such beads (Winter 1900:89). The Gablonz counterpart to the "Parisian real-gold bead" was made by only a few companies; the output of blown beads amounted to a value of about 100,000 gulden a year. The markets were "English and Dutch India, the Orient, Egypt, Central and South America" (Gablonz 1898:162).

With the invention of molds which made it possible to make ten or more beads at a time (Figures 119-122; Plate 21A bottom), production increased considerably; at the same time, prices dropped (Gablonz 1898:162). These molds are supposed to have been invented by a beadblower in 1876 (Tayenthal 1900:24). In an effort to counteract this trend, the Production Cooperative of Blown-Glass-Bead Producers (*Produktivgenossenschaft der Hohlperlen-Erzeuger*) was founded in Gablonz in 1898, but was already disbanded by around 1909-1910. At the German-Bohemian Exhibition in Reichenberg in 1906, it showed "internally painted, internally ribbed, internally silvered and gilded beads in the most diverse shapes. The exhibition material was partly arranged in the form of attractive ornaments and formed a marvelous imperial crown or, on five wall panels, flowers and birds" (Schindler 1906:1720). These were molded and free-formed beads: "…the latter show only spherical, olive or pear shapes; the former, however, represented a rather wide range of shapes. The ordinary beads are 3 and 15 mm in size, the smaller ones were all made in the mold" (Arnold 1909:90).

Schander states that the center of hollow-glass-bead production was the Kamnitz Valley with the towns of Antoniwald, Josefstal, Lower and Upper Maxdorf,

Figure 106. Work station for winding beads (using gas), Neugablonz, about 1950 (Neugablonz Industry and Jewelry Museum, Keufbeuren-Neugablonz).

Albrechtsdorf, Georgenthal, Wiesenthal, and Morchenstern. In addition to the technical innovations which became standard equipment in the Kamnitz Valley (bead machines, brass molds, Bunsen burners), secluded "enclaves" continued to make the blown bead free-hand, without molds, over a pointed flame (Schander [1954]:4b, 4c). The invention of "internally ribbed" beads (first known in the late 19th century) engendered enormous admiration:

There was considerable surprise when the freehand, internally ribbed beads were seen in sizes of 10 to almost 16 mm. The shapes, twisted once or even twice, the so-called double-twisted, far surpassed all the other shapes in beauty. Small, delicate round spheres covered with fine engraved lines as if covered with a fine silk fabric did not exist before and will never again once the freehand women

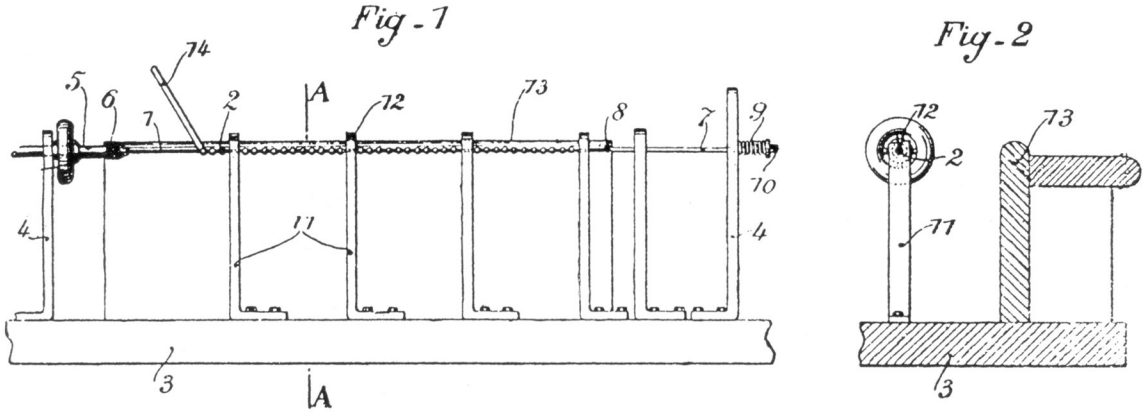


Figure 107. Mechanized production of wound beads, the process of M. Bonnet (Parkert 1925:138, Figure 29).

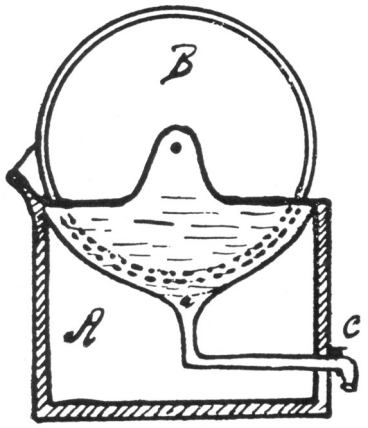


Figure 108. Sieve drum for coating beads with pearl essence (Parkert 1925:170, Figure 39).

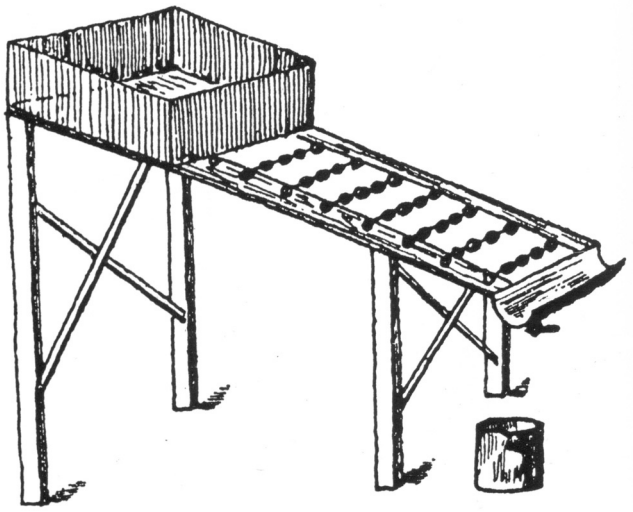


Figure 109. Device for coating beads with pearl essence (Parkert 1925:177, Figure 42).

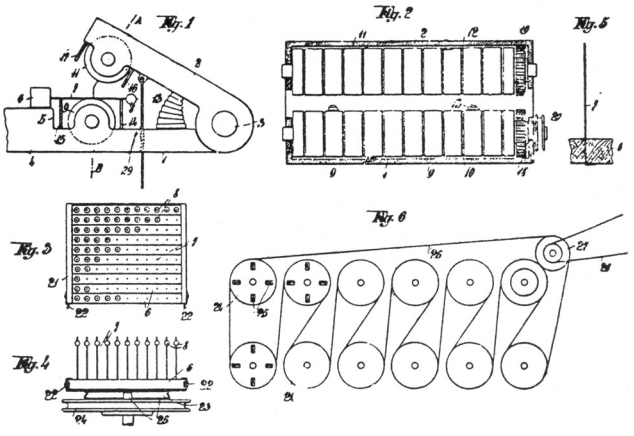
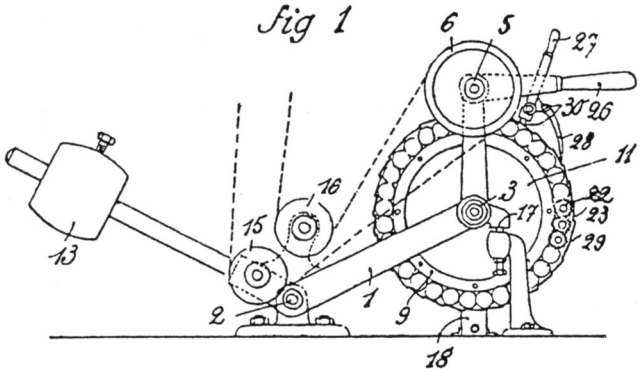


Figure 110. Machine for silvering beads with silver essence, Plessner method (Parkert 1925:175, Figure 40).



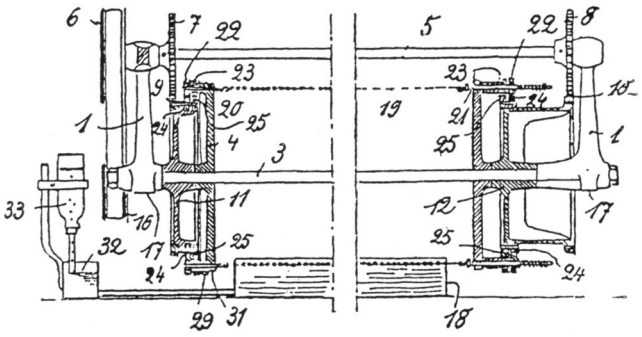


Figure 111. Apparatus for silvering beads with silver essence made from fish scales, Paisseau method (Parkert 1925:176, Figure 41).

> workers who make them are gone from the blowing table... (Schander [1954]:4b, 4c).

The internally ribbed beads were presented at the German-Bohemian Exhibition in Reichenberg:

> Many kinds of beads made of internally ribbed glass achieve the appearance of being ribbed on the outside through the method of their production. Frequently they are twisted while they are still glowing hot in such a way that the ribs appear to be turned or run into each other in blunt angles in the middle of the bead surface (Arnold 1909:90).

After the glass tubes with uniform internal ribbing were developed, special effects were achieved with irregular internal ribbing: "irregularly patterned" glass beads were made with widely differing thicknesses of the walls. Dr. Weiskopf & Co., a chemical factory in Morchenstern, received a privilege (no. 49/1273) in 1899 for this process which concerned walls with irregular thicknesses and irregular ribbing. Internally ribbed hollow glass was made by the Riedel glasshouses starting in 1910 (Schander [1954]:5b).

Figure 112. A hollow-beadworker's workshop (bead-molding machine with bellows) (Parkert 1925:158, Figure 37).

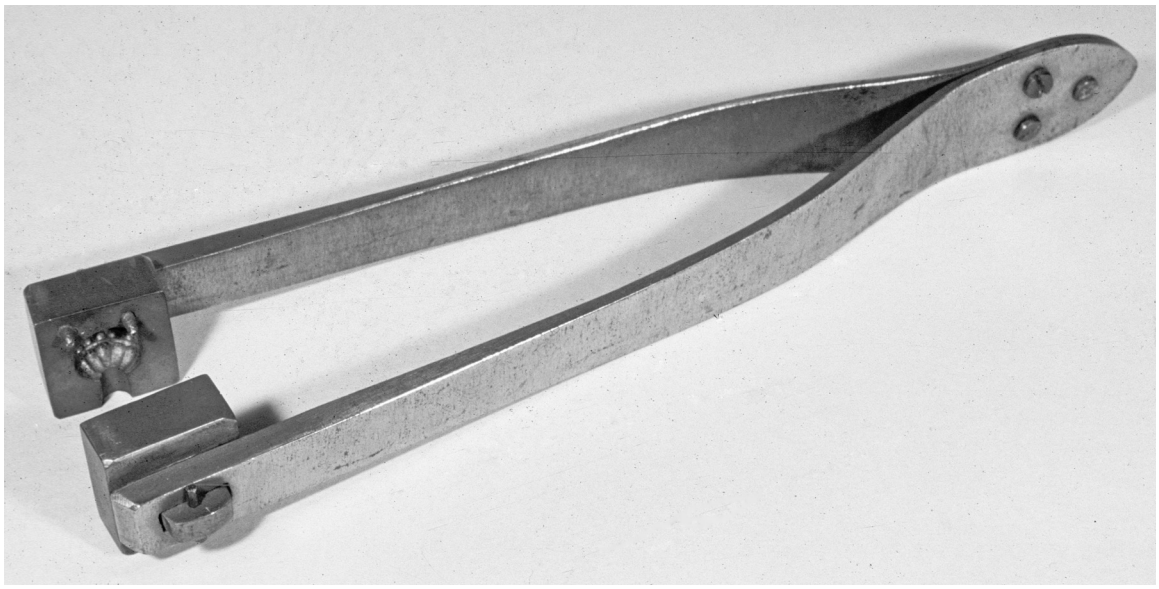


Figure 113. Shaping tongs for a glassblower; length 19.8 cm (TM 7624/22929).

In a survey of metalized hollow beads (silvered or gilded), Schander mentions round smooth beads (*Glatte*), round faceted beads (*Formperle*), acorn beads and olives, smooth cubes, cubes with little raised crosses, wreathed barrels (*Kranzelfassel*), triangles, round melon beads with ribs, melon toggles and corner toggles, end pendants (*Endbirnel*, round beads with a pear-shaped bead attached), eggs, lanterns, internally ribbed beads (blown in smooth molds exclusively), free-hand beads, and *Hafer* (elongated beads). Brass molds were employed for the smaller, less valuable beads that were used as filler beads or spacer beads. Large articles such as cabochons and pointed ovals were blown into nickel molds which guaranteed sharp edges and a high brilliance. At the time of the three "black 'booms' (between 1890 and 1914, and again around 1920), the black bead was in especially great demand, especially the smooth round beads, rhomboid and faceted molded beads, and pointed ovals" (Schander [1954]:8).

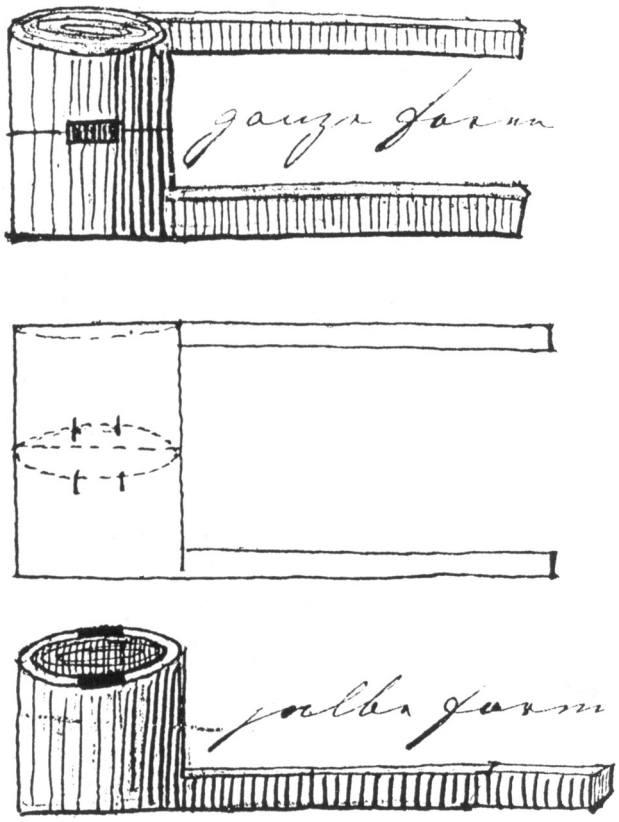


Figure 114. Process for making hollow-glass beads with a wide hole, 1886, Anton Devide, Josefsthal, privilege No. 36/1629 (Austrian Patent Office, Vienna).

Wax-filled glass beads were later replaced by beads of solid white glass (usually alabaster glass). The coating of "fish silver" was secured with varnish. These so-called imitation pearls are still put on the market today under a variety of names (e.g., the "Maharani pearls" of the Swarovski Company in Wattens, Austria). The principle of this technique of making solid beads with coated surfaces was basically nothing new, even though a different material was used: alabaster. Already in 1823, Keess points to a comparable method of making imitation pearls, when he mentions the so-called "Roman pearls" being industrially manufactured in Rome. Here a core of alabaster twisted off in the shape of a pearl is painted with "fish-scale material." Since the surfaces of these genuine "alabaster pearls" wore off quickly, the "filled glass beads" were preferred (Keess 1823:902). Solid-wax beads were made in the 19th and 20th

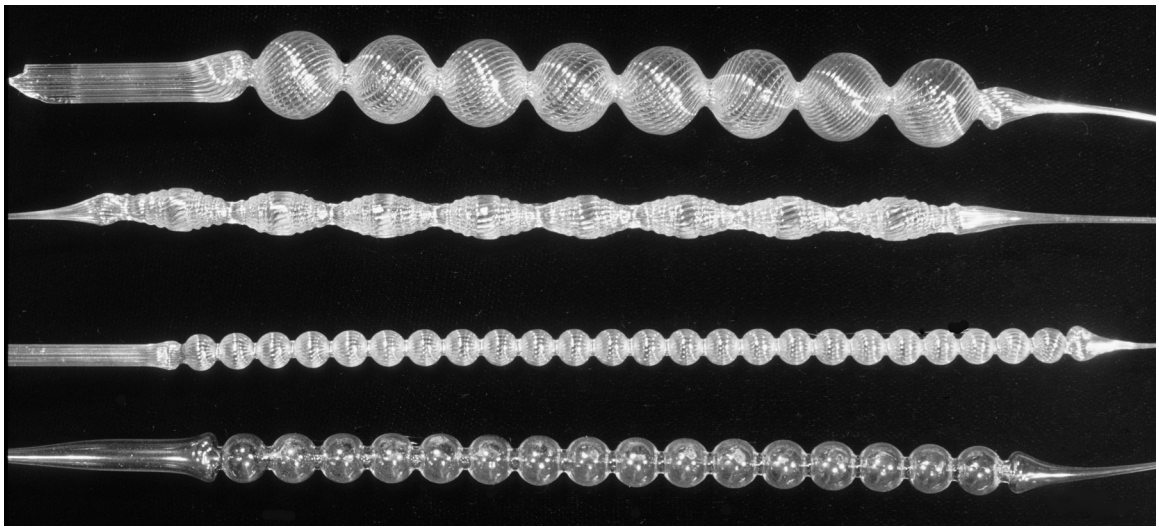


Figure 115. Row of attached free-blown hollow beads ("free-hand beads"); length (top): 18.8 cm (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

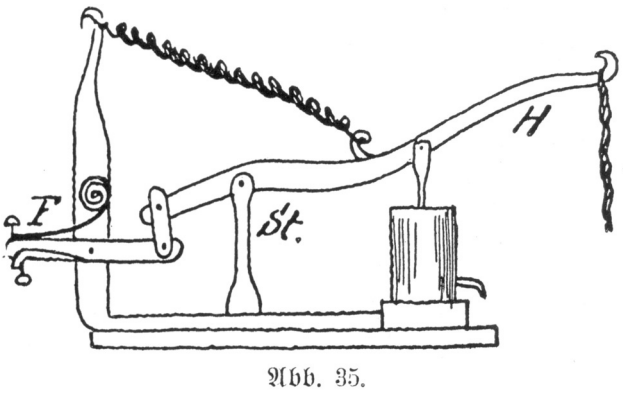


Figure 116. Bead-molding machine (using compressed air) with device for holding the bead molds (F)(Parkert 1925:155, Figure 35).

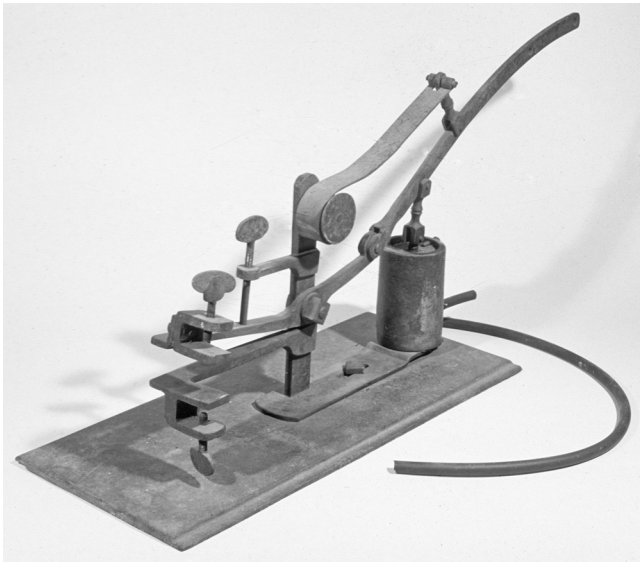


Figure 117. Bead-molding machine (using compressed air), Josefsthal, around 1900; height: 20 cm (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

centuries and many companies still produce them. "Solid beads with fish-scale decoration applied on the outside" were shown at the German-Bohemian Exhibition in Reichenberg (Schindler 1906:1721).

There is evidence of a number of companies that specialized in making solid-wax beads around 1930 (Lodgman and Stein 1930):

> Andreas Hampel/Gablonz; Belda & Co./Turnau (since 1920, the *Orienta* and *Eterna* wax beads); Finger & Co./Doubrawitz near Königshof ("Wax beads of every kind, buttons, chains and necklaces, one- and two-hole beads, candle drip collars, etc., in all qualities, hollow and solid, and in all colors"); J. Posselt/Gablonz ("Thuringian wax beads / solid wax beads of all kinds"); Adolf Kopal/Gablonz ("Wax beads, Thuringian beads of all sorts, such as half beads, hollow spheres and buttons, hollow-iris, filled, iris-filled, through-hole knitting beads, spacers, necklaces in chains and pendant, also solid waxed; always something new and all kinds of colors..."); Hugo Tischer/Gablonz ("Production of all kinds of glass beads, especially real gold beads and fine silver beads in shiny, matte, and all colors; rocailles and bugles"); Gustav Weisskopf/Gablonz ("Special production of strung wax beads in all sizes").

SAMPLE CARDS OF THE REDLHAMMER AND MAHLA COMPANIES

In 1913, the Technical Museum for Art and Industry in Vienna received a "collection of samples of porcelain beads and buttons" as a gift from the Redlhammer Brothers Company in Gablonz (Plates 19C-D, 25A-43A). The sample cards from the Mahla Brothers probably came at the same time (Plates 43B-50). Both companies were strongly export oriented. While Redlhammer also made its "porcelain beads" itself, Mahla was concerned with the export business that was essential to the existence of the entire Gablonz industry.

> ... the exporter – that's what the current terminology calls the glass dealer – takes the new samples given him by the people hoping to work for him ("Gurtler," glass molders, glass spinners, etc.) or he has such samples taken up through his own people, specifically the so-called sample makers, and sees to it that they reach customers, chiefly foreign trading companies, either directly or through traveling salesmen, as a help in making a choice and ordering. Also sometimes such customers even send in a sample of foreign origin, whereupon the exporter has the desired amount made.
>
> As a rule, the sample, for which orders are placed, requires the work of several groups of workers.... Between him and the different producers is the supplier. With him, the exporter settles on the price of the wares to be delivered, based on specific samples and the time of the handover (delivery) of such wares; the remaining "how" and "what" in regards to production do not concern him. The supplier either limits himself to actual delivery without personally having a part in the production, or he owns a workshop, a cutting or molding works,

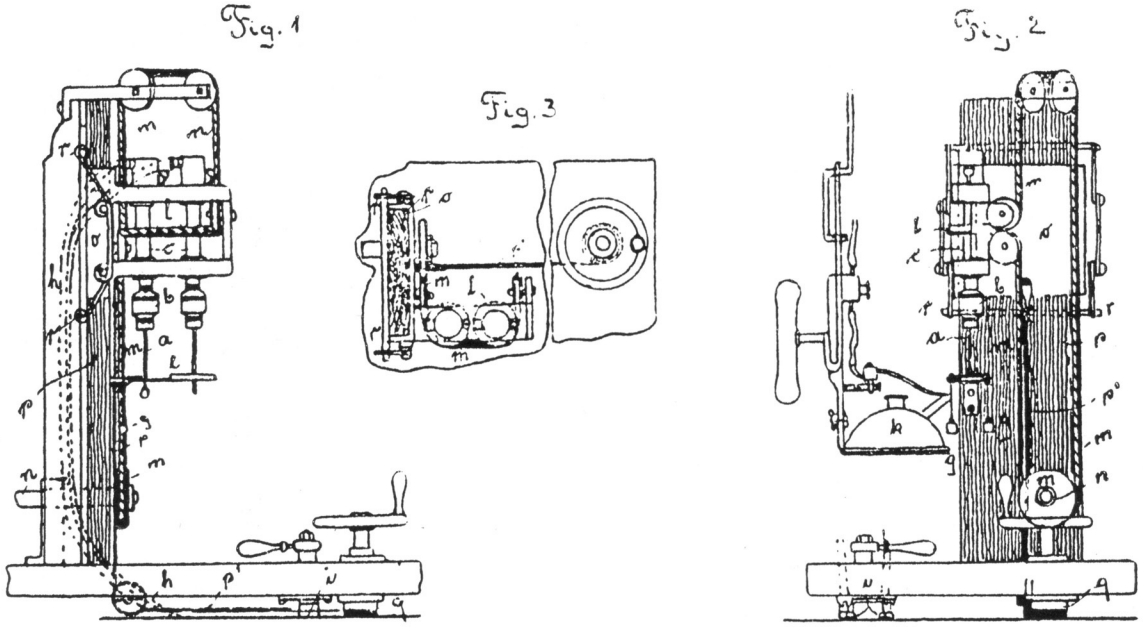


Figure 118. Machine for making hollow-glass beads (Jossand method) (Parkert 1925:156, Figure 36).

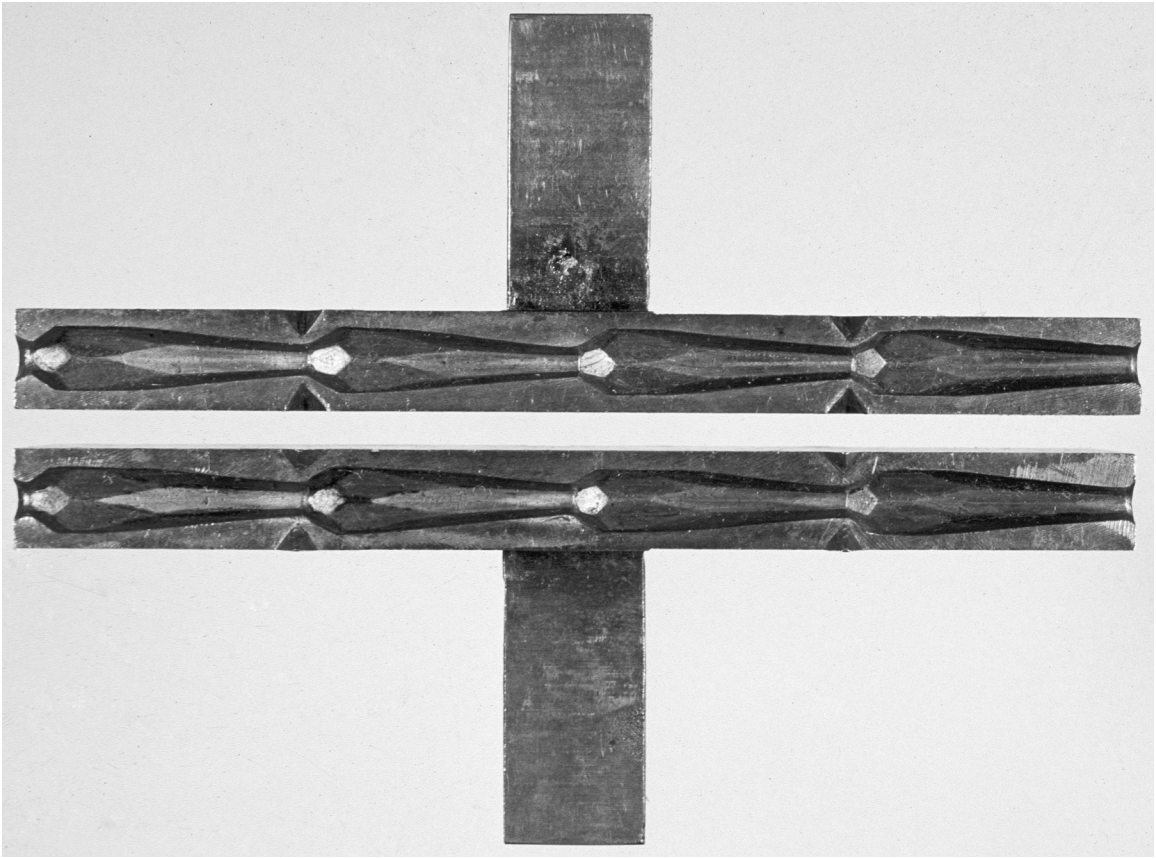


Figure 119. Two-piece mold for eardrops; length: 11.5 cm (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

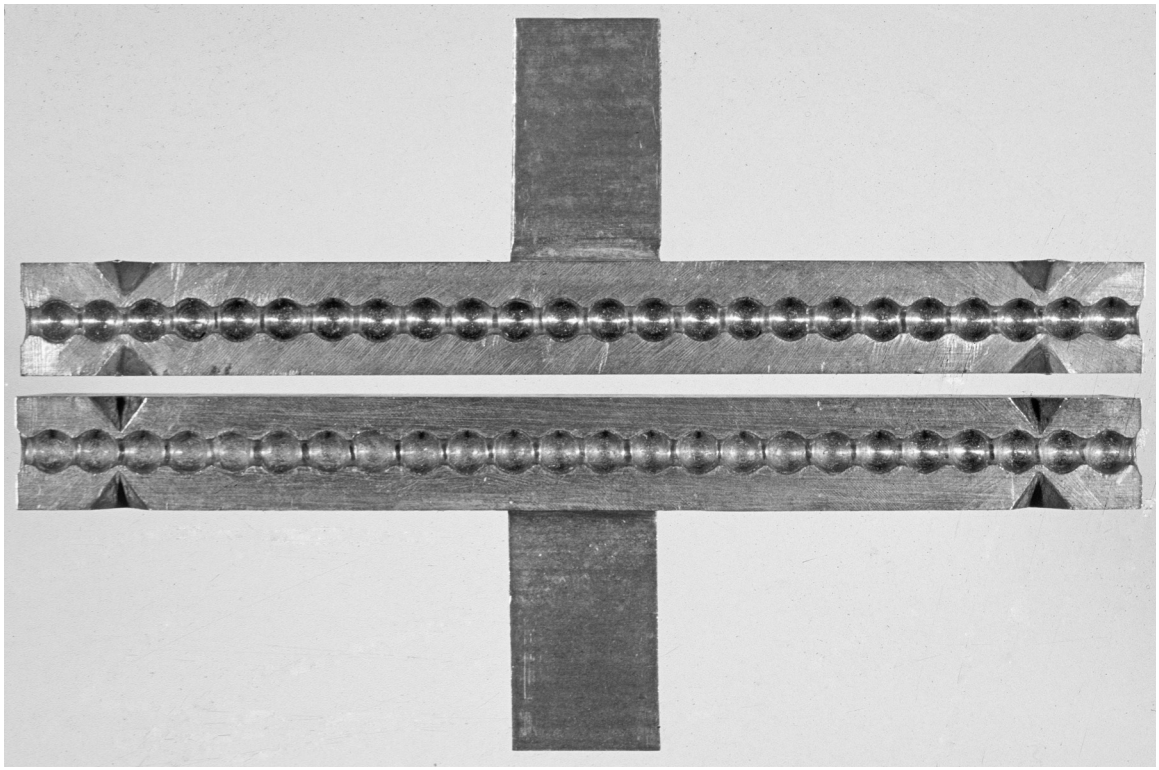


Figure 120. Two-piece mold for beads; length: 13 cm (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

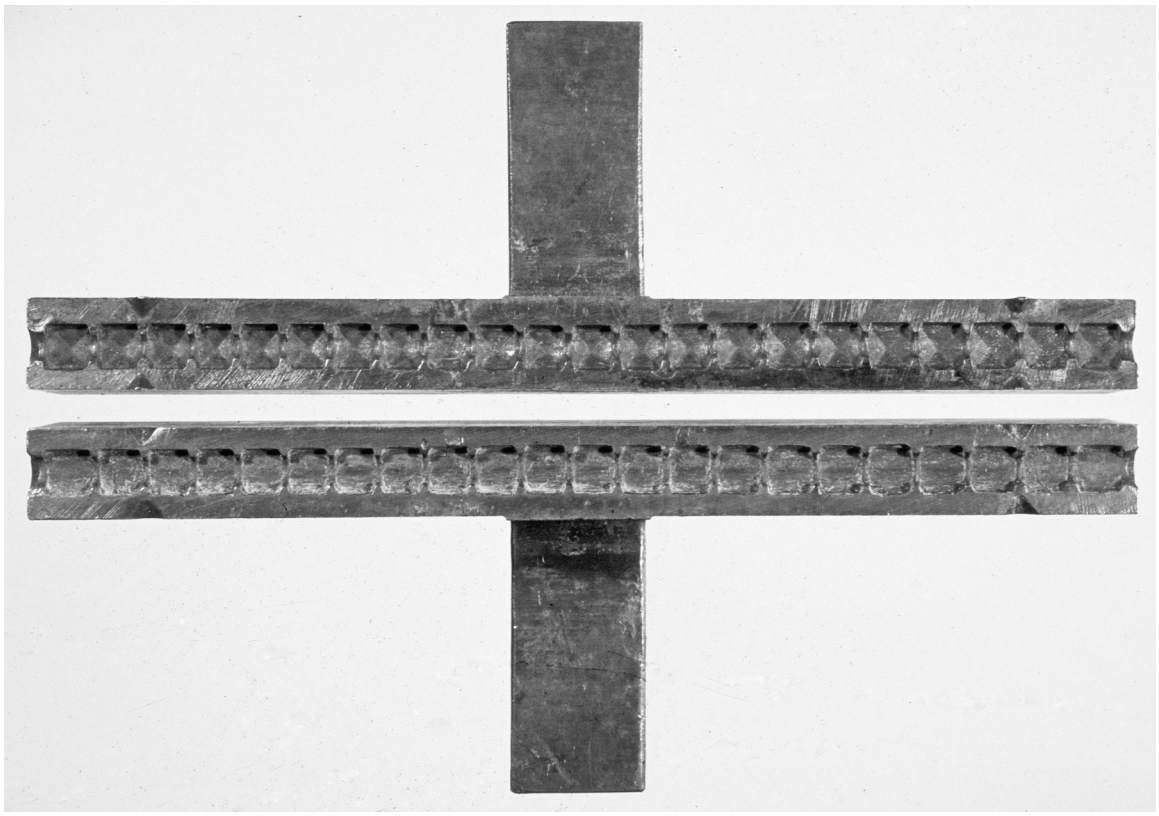


Figure 121. Two-piece mold for beads; length: 11.6 cm (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

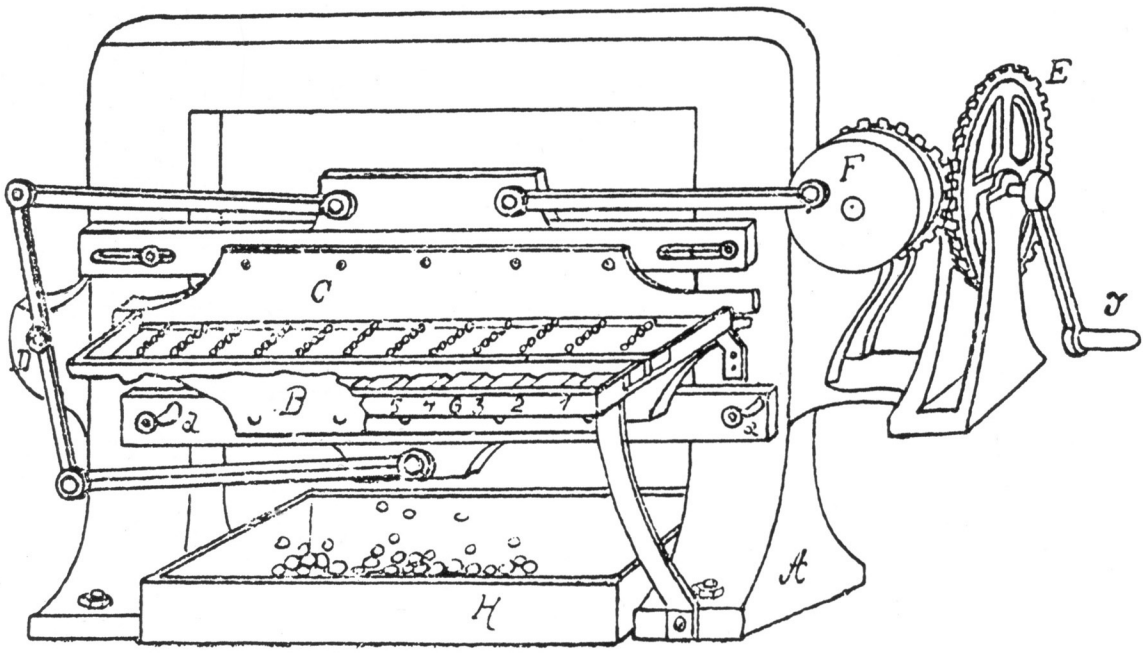


Figure 122. Device for segmenting beads (Parkert 1925:159, Figure 38).

or a *Gürtler* workshop or something similar. In the former case, he is strictly a middleman who supplies the raw glass, which is made in the glasshouse or bought from a merchant, to the molder and then the cutter for further processing, negotiating the wages with each one and finally delivers the finished wares to the purchaser at the prices agreed upon with him beforehand... (Bráf 1882, according to Lilie 1895:198).

The wares produced by the glass and metal smallwares industry are not placed on the market by the producers themselves, but by the export trade.... It can even be said that without the export trade, the so very important economic upswing would never have come about. At present there are some 150 export companies in the district. The largest of these are considered to be: in the crystal branch, the company of Eduard Dressler; in the buttons branch, the Mahla Brothers Company; in bijouterie wares, that of W. Klaar; in the beads branch, the company of J.H. Jeiteles Sohn....

The sample-makers division does not by any means make all the necessary samples itself..., but it procures them for the purpose of placing them on the sample cards (collections) it creates, but the sample specialists do in exceptional cases also work out independent designs and make new samples. Working out the prices, the tasteful arrangements on the sample cards, fastening, etc., require additional labor... (Lilie 1895:197, 198).

Around the turn of the 20th century, the Mahla Brothers Company (founded in 1878) owned an export house in Gablonz a.d. Neisse, a "Factory of Glass and Metal Buttons, Crystal Wares, and Glass Smallwares" in Morchenstern, a cardboard factory in Pasek, and branches in Berlin, Paris, and London, and representatives in Vienna, Frankfurt, and Hamburg. Around 1900, 300 workers and 120 employees worked for them (Adressbuch 1900:117); around 1910, there were some 500 workers (Hanel 1910, 1:194).

Although not all of the original cards are preserved, the Mahla sample cards provide a good overall view of Gablonz beads: little bugles and drawn beads (Plates 43B-C) made of crystal glass (which can be lined with color) and colored glass; solid beads in round and oval shapes, smooth or facted or ornamented, most of them probably pressed beads (Plates 44A-46B); Atlas beads in different colors (Plates 46C-47A); hollow beads with color and silver linings (Plates 47B-48A, 50); fine gold beads (topaz glass with silver linings) (Plates 47B, 48B); and the beautiful real-gold beads (crystal glass with a gold lining) with melted ("heated") openings (Plates 48B-49C). The measurements are given in numbers, lines, or millimeters. The size of the 0-bead sometimes corresponds to the norm (2 lines = ca. 4.5 mm), but sometimes also deviates from it. The measurements in millimeters are only approximate values (the beads are usually smaller).

We have Walter Redlhammer to thank for an extensive Redlhammer Company chronicle from the year 1952. Zenkner also treats the history of the company, whose owners were dispossessed in 1945 (Zenkner 1984:48-68). Eduard Moritz Redlhammer (1829-1918) leased space in Gablonz in 1882 for an export company that dealt with the sale of all Gablonz articles, including "brooches, hairpins, Christmas tree ornaments, glass and metal buttons, all kinds of glass beads, perles lustrés (Oriental beads), crystal wares, chandelier pendants, and stones for imitation jewelry (*Simili*)" (Redlhammer 1952:11). In 1885, Redlhammer also leased a little glasshouse in Maffersdorf. Later the company was transferred to his sons (the Redlhammer Brothers).

Walter Redlhammer describes the first attempts with Oriental beads as follows:

> In the export business, customers often asked for the so-called Oriental beads. These beads were made by F. Bapterosses and Cie. in Paris and by Risler & Co. in Freiburg.... By chance there was a man named Möldner who claimed to know how to make these beads. The technical procedure was such that a soft paste made up of certain ingredients was put into wooden molds, dried, and fired in a kiln heated with generator gas. The beads made this way were not completely identical in shape, not very transparent, but sold well and at a good price because of the economic boom. It soon turned out that the beads made this way actually required a different process.... Eduard and Albert R. [Redlhammer]... therefore, in the spring of 1890, decided to take chemistry lessons from a professor by the name of Kaempf at the Imperial State Trade School.... The continuation of chemical experiments in the factory that had meanwhile been finished in Gablonz became more systematic.... The new chemical and technological basis that was established after a great deal of careful work had to change the previous methods of production completely. The chemical structure of the basic pastes for making Oriental beads had been discovered. The furnace already in operation was used for the test batches.... In the... factory's metal works in Görsdorf, the first regular implement aggregate (machines for the hand presses) for pressing the beads was made in the years between 1889 and 1890 under Zähringer's supervision... (Redlhammer 1952:12-14).

In 1893, the "bead-lustering works equipped by Julius Bendel" went into operation and the pressing works got additional hand pressing machines (Redlhammer 1952:23). At the Paris World's Fair (gold medal awarded to the export division), Eduard Moritz Redlhammer acquired a bead-stringing machine which was rebuilt, improved, and copied in Gablonz. The production line was offered in several languages in an advertisement around 1900: "Agate-Buttons / of different kinds and colors. / Imitation Ivory / and Imitation Pearl / China Shirt-cuff-Buttons. / China Beads of all colors / Agate-Finger-rings" (Adressbuch 1900: advertisement section).

In 1902, the pressing works had 24 hand pressing machines and a fly press for buttons (Redlhammer 1952:32, 34). In 1906, a new factory was built at a larger site on Hüttenstrasse in Gablonz. At the German-Bohemian Exhibition in Reichenberg (Arnold 1909:125, 126) the company was represented by a wealth of objects:

> The porcelain bead and button factory of the Redlhammer Brothers Company in Gablonz is exhibiting oriental beads, agate buttons, and other articles for export. The brilliantly colored display shows us beads and buttons of different shapes and colors attractively arranged in long strands, and scattered in between them, colored glass rings and medallions. The sphere at the peak of the pyramid-shaped construction is decorated with articles made by the company. The bottom of the cabinet contains boxes with glass buttons and appliqué items and the vertical sides of the substructure of the pyramid are arranged very tastefully with different kinds of glass buttons. The company is showing a completely new line of products being introduced into Austria. Despite being mass produced, the products come in excellent shapes and the colors are just as varied as they are rich. The company has existed since 1882. The beads, made mostly for export, are used for bracelets, necklaces, and other jewelry items, and they are also used in barter trade as money, while the buttons go to European countries for the most part as a mass article. The products enjoy an excellent reputation everywhere for their quality and beauty.

A remarkable body of 400 workers and about 1,500 cottage workers is mentioned in 1907 (Adressbuch 1907:306). At the invitation of Bapterosses & Cie. in Paris, the companies Risler & Co. in Freiburg, Ferd. Schmetz in Aachen, Fratelli Simonis, Candiolo in Turin, and the Redlhammer Brothers in Gablonz negotiated over a price agreement. This resulted in the establishment of a syndicate and the fixing of production quotas, with Redlhammer in third place (Redlhammer 1952:45).

In the matter of patents and trademarks, the company also sought to protect its rights: from 1889 to 1908, several trademarks were registered for Redlhammer. In 1908, we find the "Panther Head" mark (for "pearl-like articles,

porcelain buttons, and porcelain beads") for the first time. It is familiar to us from a number of sample cards (Plates 25A-B, 26B-C, 32C) (Zentralmarkenanzeiger 1908:211). In the same year (1908), an important contemporary source reports on the Redlhammer Brothers' Porcelain Bead and Button Factory, Gablonz:

> A very singular industry which was not represented in Austria at all only a short time ago and is still only represented by one large enterprise is the manufacture of porcelain beads and buttons. These articles are generally known in the trade under the name, "Oriental Beads" and "Agate Buttons:" they are ceramic products which are fired at a very high temperature and which require an extraordinarily high degree of specialized knowledge and very complicated machinery and equipment for their production.
>
> The Redlhammer Brothers Company in Gablonz, which has taken up this industry rationally for the first time, is far older than their current manufacturing processes. It was founded already in the year 1854, by the Imperial Councilor Eduard Redlhammer and his brother Albert and originally operated a woven-goods factory in Rochlitz near Reichenberg. It was not until later that it changed over to the production and export of glasswares, porcelain beads and buttons. Since this industry, as we know, has always been at home in the Gablonz area, it was logical for the company to move to Gablonz so that its new line of production could develop properly. In 1896, the company built its own factory here. It has had to be expanded a number of times since then. The owners of the company succeeded in overcoming the unusual technical difficulties they encountered in developing a usable product. A continuous improvement of the machinery assisting production made it possible to perfect the quality of the product even more. At the same time new business connections were made, trips were taken to foreign countries, and representatives were situated in all the important export locations on the continent.
>
> The owners always kept an eye on the task of expanding the local industry as a whole. They did not stop at establishing this new branch of manufacture that was still in the development stage, but endeavored to bring it to the highest degree of perfection. They have achieved this goal since the porcelain beads and buttons they make are exported all over the world and are able to maintain their importance on the world market to an increasing extent, regardless of the very lively foreign competition.... In 1905, an important site was purchased in Gablonz and a big new factory built on it... thus, in the year 1908 alone, an important expansion of the factory took place.... The equipment for the works includes a large number of special machines and devices constructed by the company itself. Some of them are not used anywhere else in the country and are made in the company's own machine shop. A 150 h.p. steam engine with modern precision controls takes care of the mechanical drive for the manufacturing machinery. In addition, there is a lighting and power plant for operating various motors and the machine workshop... (Mahla 1908:381).

The Redlhammer Brothers' sample cards in the Technical Museum (complemented by a few cards from the Gablonz Archive and Museum in Kaufbeuren-Neugablonz) comprise the most complete collection of its kind, even though they apparently consist of examples from different series. All of them, however, have the same pressing technique in common. The cards display the popular and famous *Perles Orientales* (Plates 27A-B), as well as the short cyclindrical beads in different variations (Plates 28C-29C): the so-called cylinder beads (*Walzenperlen*) (Redlhammer 1952:74), which were also called tube beads (*Röhrenperlen*) and once, strangely enough, even *Rocailles* (Plate 28C); round and oval beads, discs, rings and stars; façon beads of various types, and finally, the "tooth-like interlocking" beads patented in 1896 which create smooth chains (Figure 123; Plates 36A-C).

The sizes of these pressed beads can rarely be classified according to prescribed norms, especially when they take on unusual elongated shapes or only form a whole in three-part motifs consisting of demi-olives and discs (Plates 38A-B, 39B-C).

ACKNOWLEDGEMENTS

This work was made possible with the assistance of many people and institutions. Interest in a common subject led to the formation of working groups from which friendships grew: the fascination of glass and porcelain beads had drawn us into its spell. I wish to thank all of them here. Those who obligingly placed their knowledge and their private bead treasures at my disposal, those who helped untiringly to solve difficult problems, and those whose enthusiasm contributed to coping with the immense volume of the material they themselves helped create. My gratitude also extends to all the people and institutions mentioned below, who have thus far supported me in my research in every imaginable way:

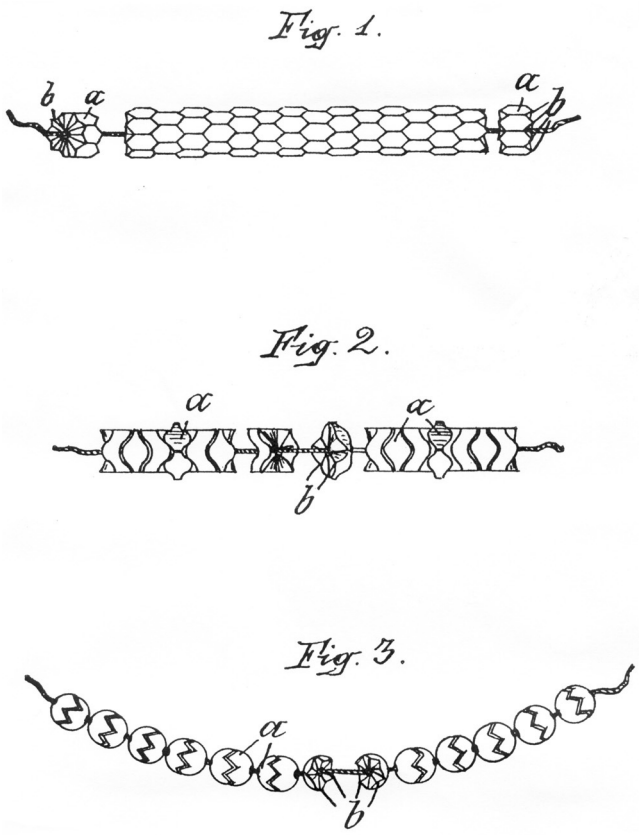


Figure 123. Tooth-like elements meshing with one another for a piece of jewelry, 1896, Redlhammer Brothers, privilege no. 46/3959 (Austrian Patent Office).

Thomas Werner (Director of the Technical Museum, Vienna) and his staff.

Alfred Lechner, the founder and former director of the University Archive of the Vienna Technical University.

Erich Jiresch, head of the University Archive of the Vienna Technical University, also Juliane Mikoletzky and Johann Axnix.

Ingrid Weidinger (Director of the Library of the Austrian Patent Office, Vienna) and her associates (Brigitte Reicher, Walter Amstötter, Helmut Hammel, and Wilhelm Korinek)

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Susanne Rössler (Neugablonz Industry and Jewelry Museum e.V., Kaufbeuren-Neugablonz) and her associates.

Walter Dürr (Director of the Museum for Nature and Urban Culture in Schwäbisch-Gmünd) and Monika Boosen.

Klaus Breit, Schwäbisch-Gmünd; Mario Coressi, Vienna (M. Hurtz and Sons, Vienna, "Goldperle"); Heinz Fitschek, Steyr-Gleink; Adolf Glaser, Schwäbisch-Gmünd; Artur Kratzmann, Enns; Alfred Mantel, Sr. and Jr., Mauerstetten-Steinholz; Maria Reiter, Vienna.

Prof. Ludwig Neustifter for designing the dust-jacket for this book.

My warmest thanks also go to Fritz Kaltenbrunner, Alfons Pessl, and Joschko A. Buxbaum, particularly, for their unstinting efforts and their active support for the book and the exhibition project; Fritz Kaltenbrunner even undertook the arduous work of correcting the manuscript with admirable patience.

Ann Dubsky devoted herself to the subject and its difficult terminology in the English translation with special dedication. There is no doubt that she performed pioneer work in doing so, chiefly in dealing with highly specialized problems which – although appearing to be untranslatable at first – she mastered with bravura.

ENDNOTES

1. Editor's note: Self-published in 1994, Dr. Waltraud Neuwirth's book, *Perlen aus Gablonz: Historismus, Jugendstil / Beads from Gablonz: Historicism, Art Nouveau*, is one of the most useful publications for both bead researchers as well as bead aficionados who wish to understand the Bohemian bead industry and its products. Unfortunately, not only is this reference out of print but it is hard to find in libraries outside of Europe and impossible to purchase at a reasonable price anywhere. To make this valuable resource available to researchers and collectors around the world, Dr. Neuwirth has granted permission for the English text to be republished herein. The text essentially remains the same though the format has been changed slightly to conform to journal style. In addition, some text omitted from the initial translation has been included, a few typos have been corrected, and some problematic terminology has been clarified. To allow the color images to be published together, the illustrations have been segregated into two groups: the black-and-white images are now Figures while the color images are Plates. The editor extends his heartfelt thanks to Dr. Neuwirth and her translator, Ann Dubsky, for making this publication possible. Special thanks are also due the Bead Society of Los Angeles for a generous grant that helped with the publication of this issue.

2. Editor's note: It is now generally accepted that 150 m is an exaggerated figure and that 150 *feet* (ca. 45 m) was the likely maximum length of the drawing gallery (Carroll 2004:30, #10).

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Dr. Waltraud Neuwirth
Weinzingergasse 10, Haus 18
A-1190 Vienna
Austria
E-mail: waltraud.neuwirth1@chello.at

Ann Dubsky
Strassergasse 15/1
A-1190 Vienna
Austria
E-mail: a.dubsky@inode.at