> 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

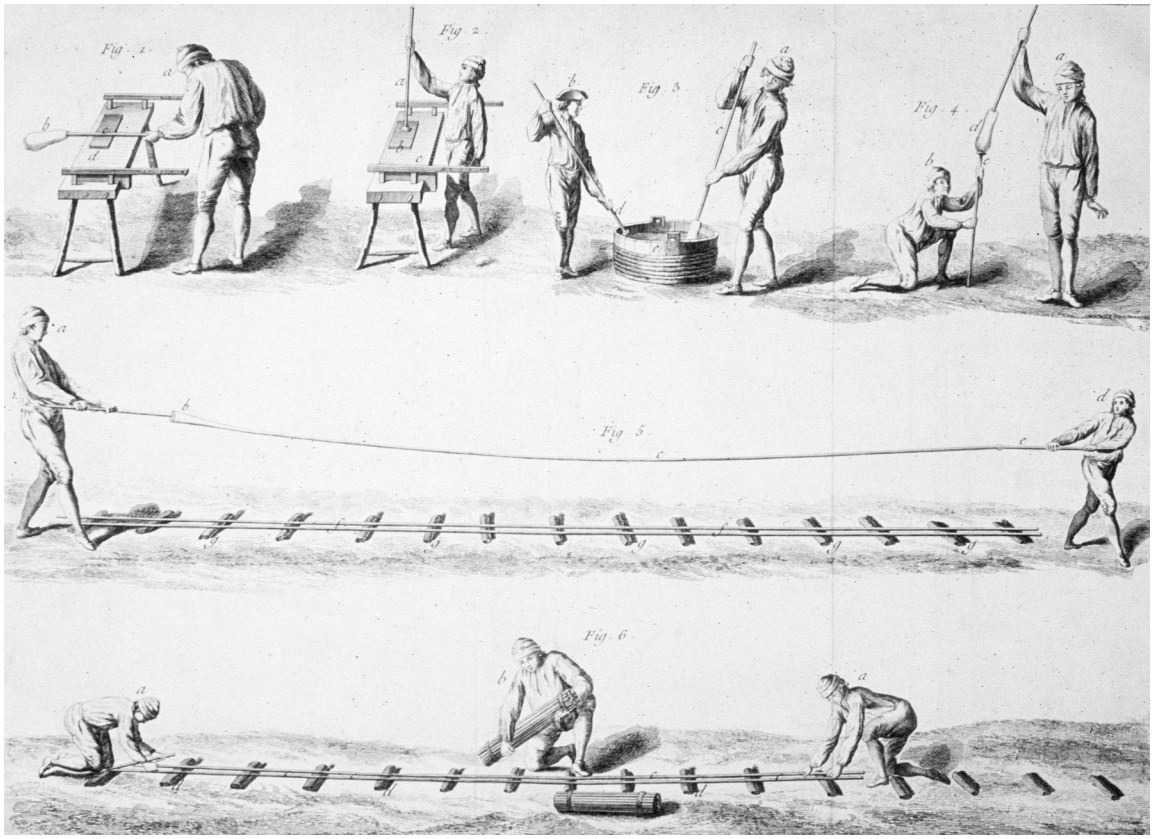

Figure 32. Drawing glass tubes: *Verrerie en bois, Différentes Opérations pour filer les Tubes des Barometres, pour les couper &c. &c.* (Diderot and d'Alembert 1772, 10: Plate XXI).

> 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).

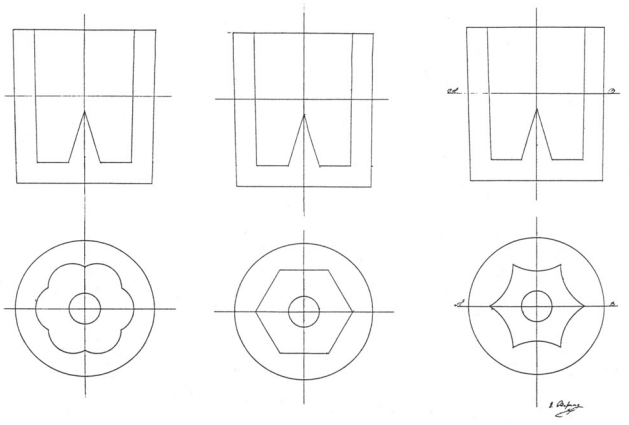

Figure 33. Privilege for making rods, 1864 (*Fabbricazione della Canna di Vetro e Smalti, scannellata, angolare e a rosetta*), J. Bassano, privilege no. 8396 (Austrian Patent Office, Vienna).

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

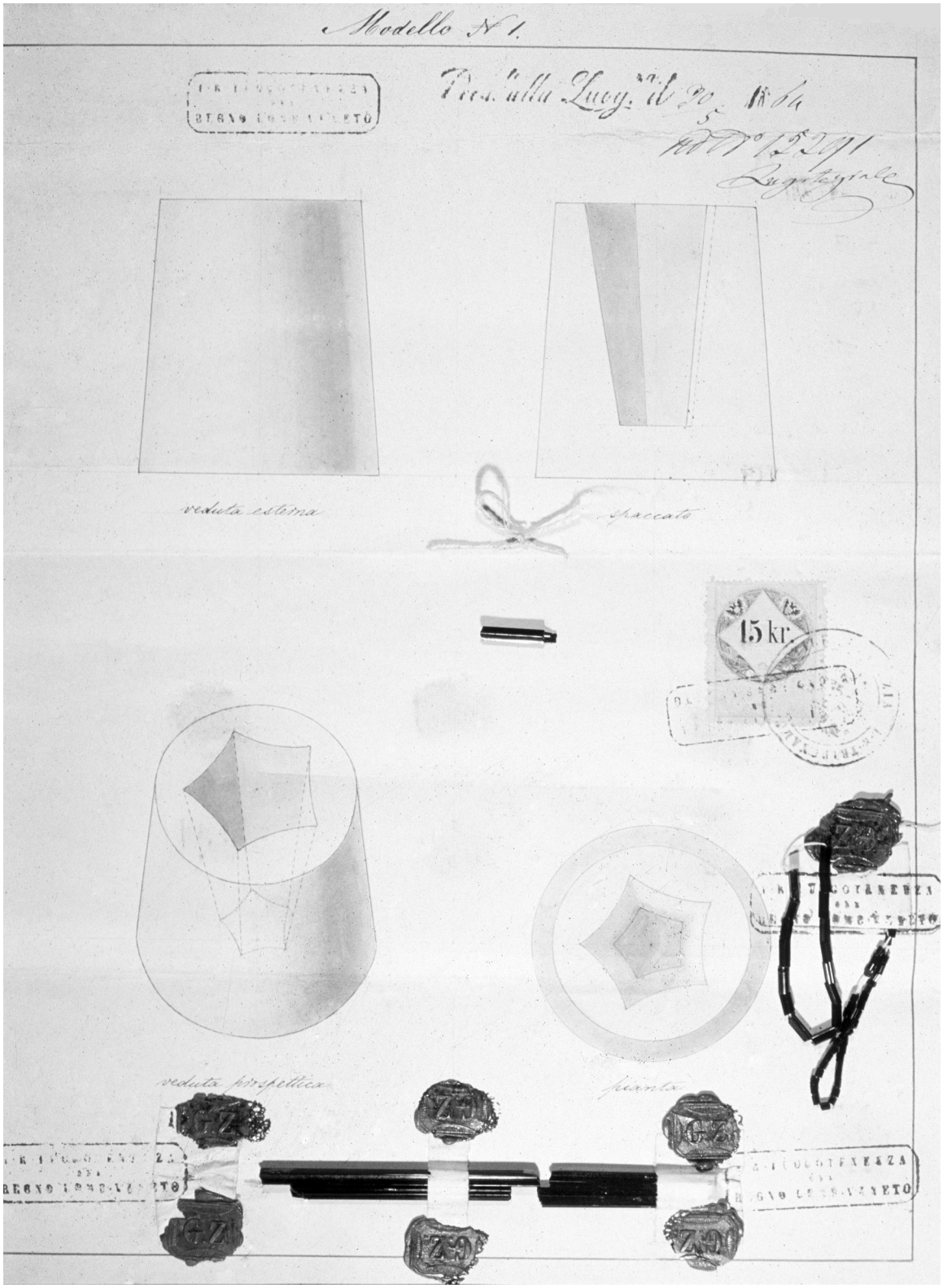

Figure 34. Privilege for making rods, 1867 (*Fabbricazione della Canna di Vetro angolare prismatico*), Giuseppe Zecchin, privilege no. 10280 (Austrian Patent Office, Vienna).

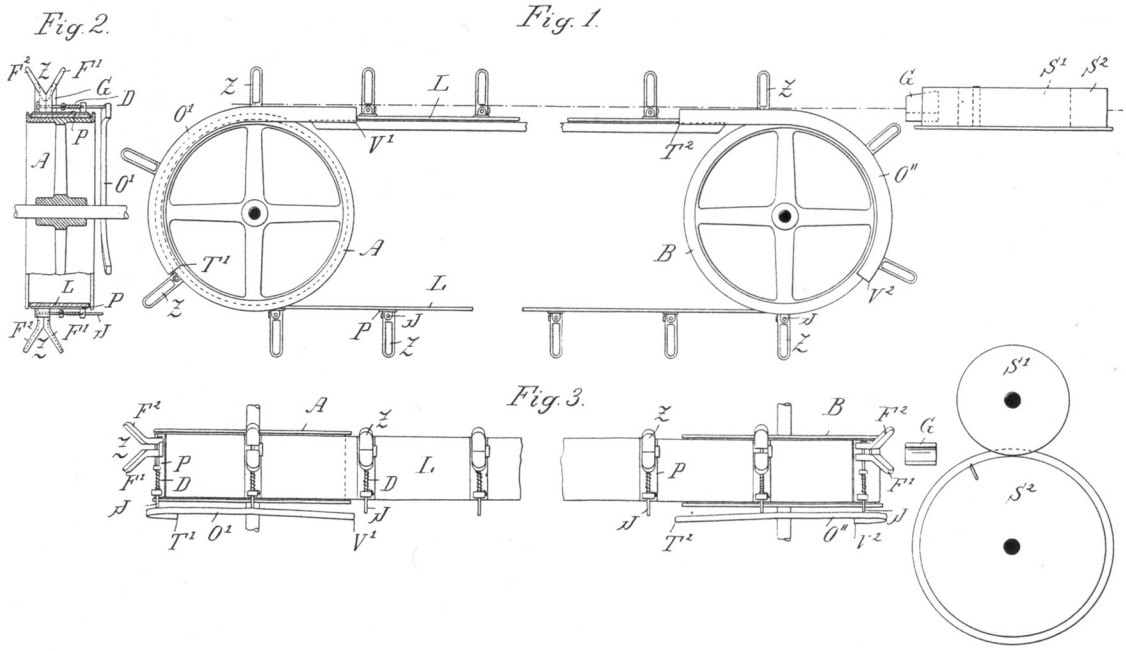

Figure 35. Device for drawing molten glass into tubes and rods, 1896, Josef Riedel, Polaun, previlege no. 46/2423 (Austrian Patent Office, Vienna).

> 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

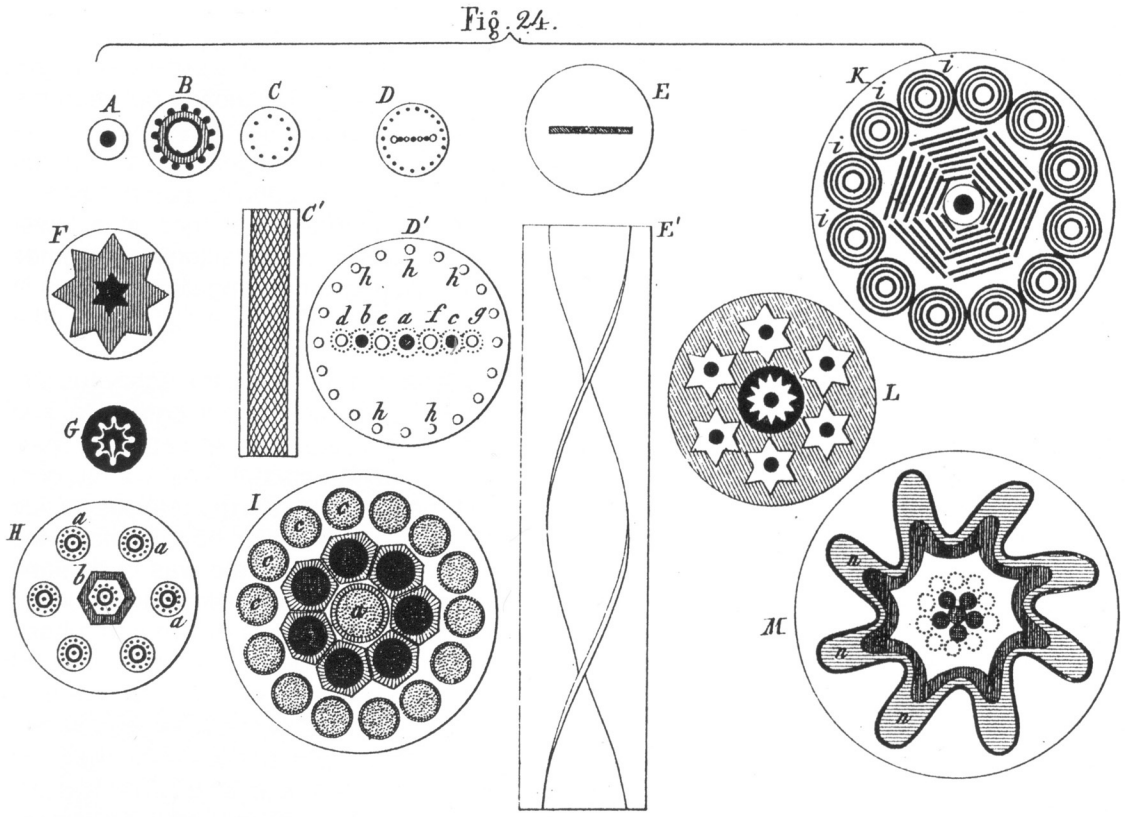

Figure 36. Filigree and millefiori glass (Karmarsch 1861a; Prechtl 1834:3, Figure 24).

> 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

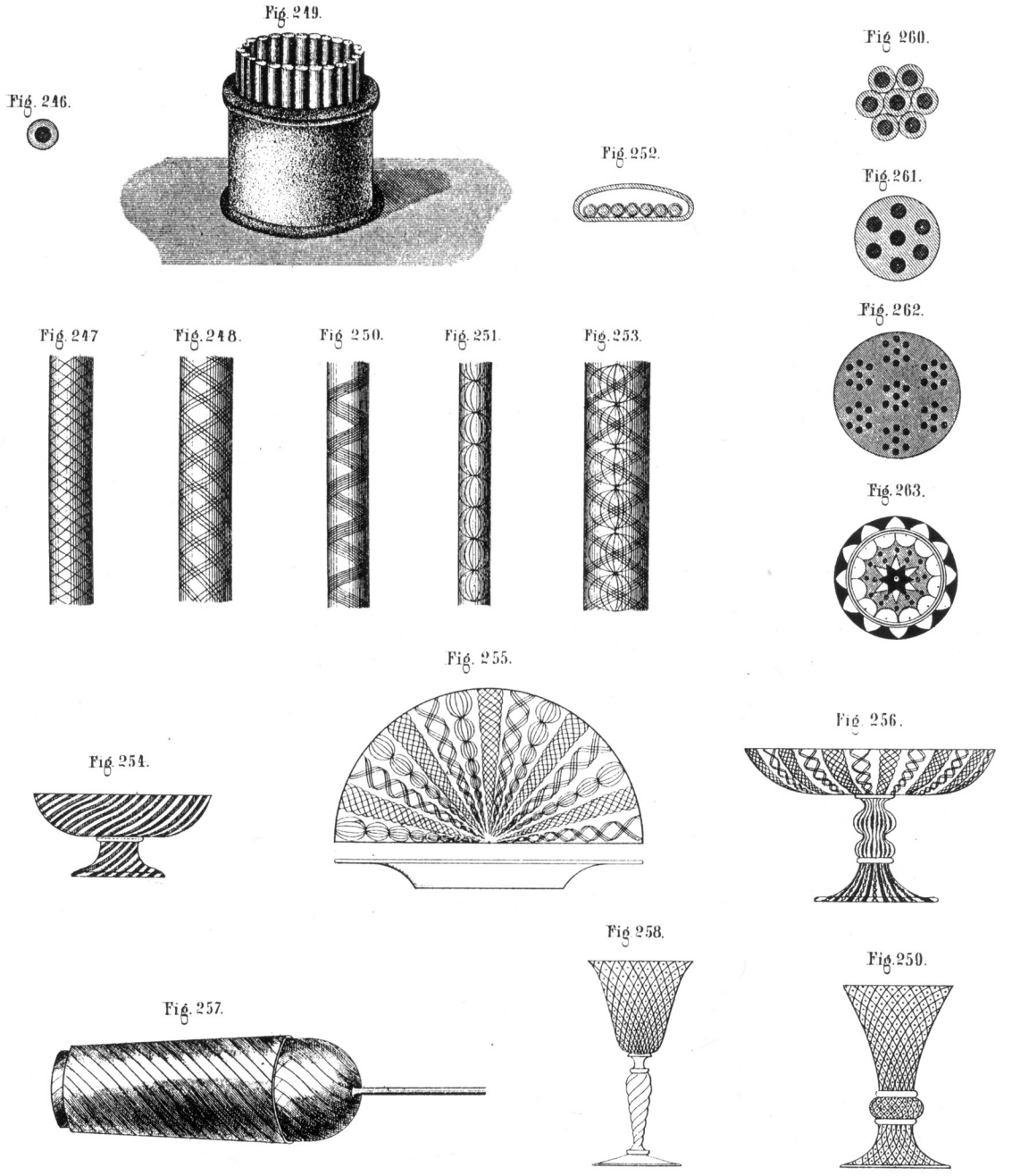

Figure 37. Production of filigree and reticulated glass (Tscheuschner n.d.: Plate XXIII).

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

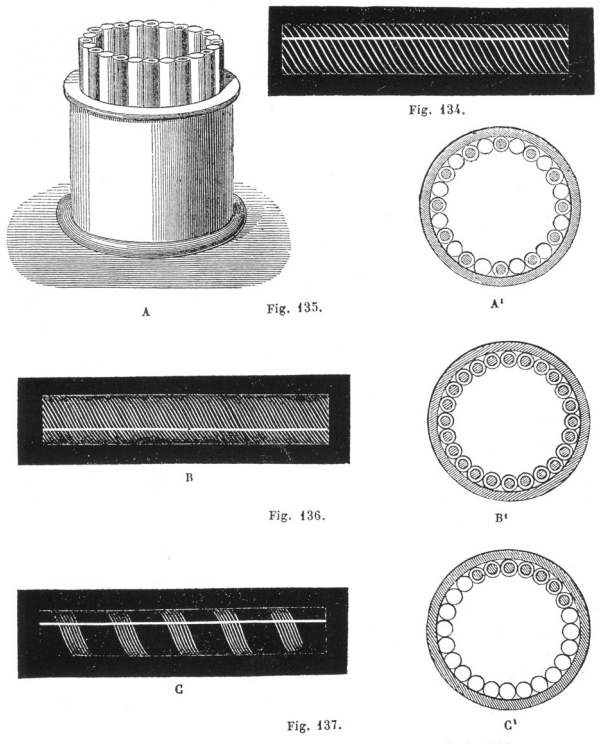

Figure 38. Network and filigree patterns (after Bontemps 1868:604, 605).

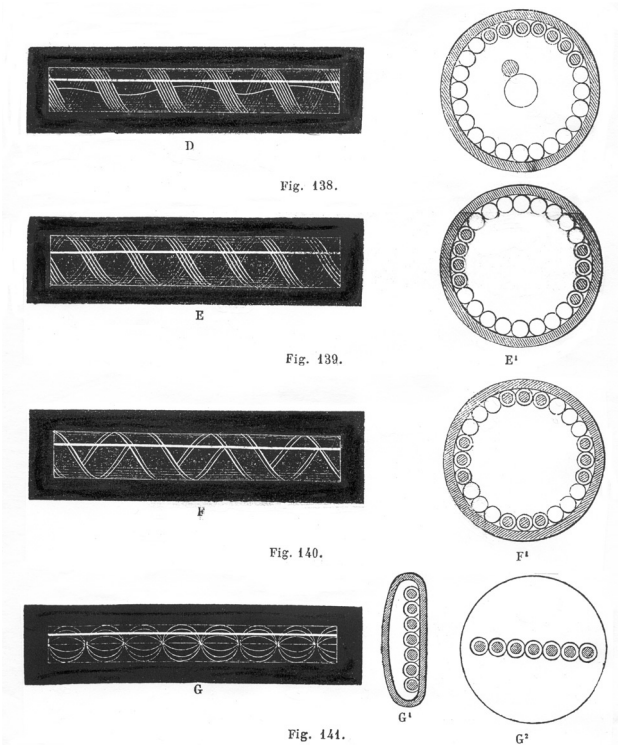

Figure 39. Network and filigree patterns (after Bontemps 1868:607, 608).

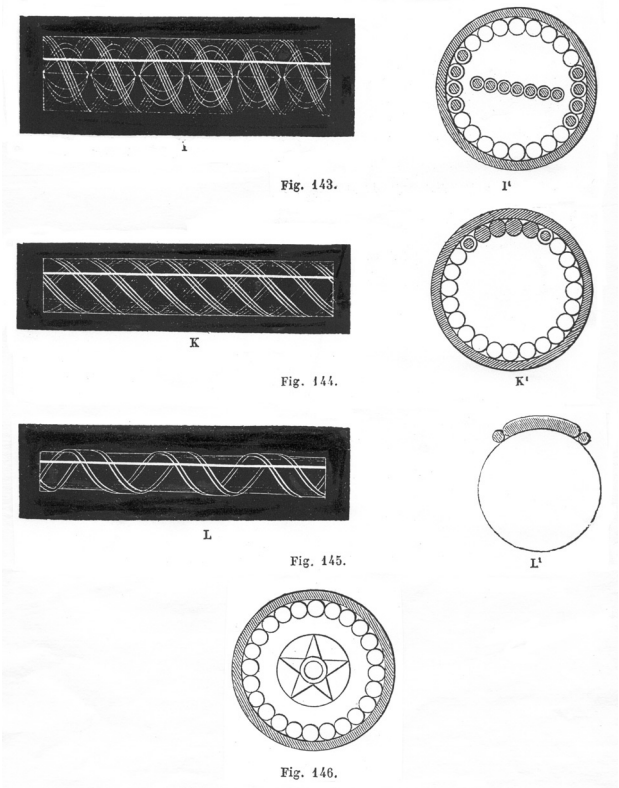

Figure 40. Network and filigree patterns (after Bontemps 1868:608-610).

"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,

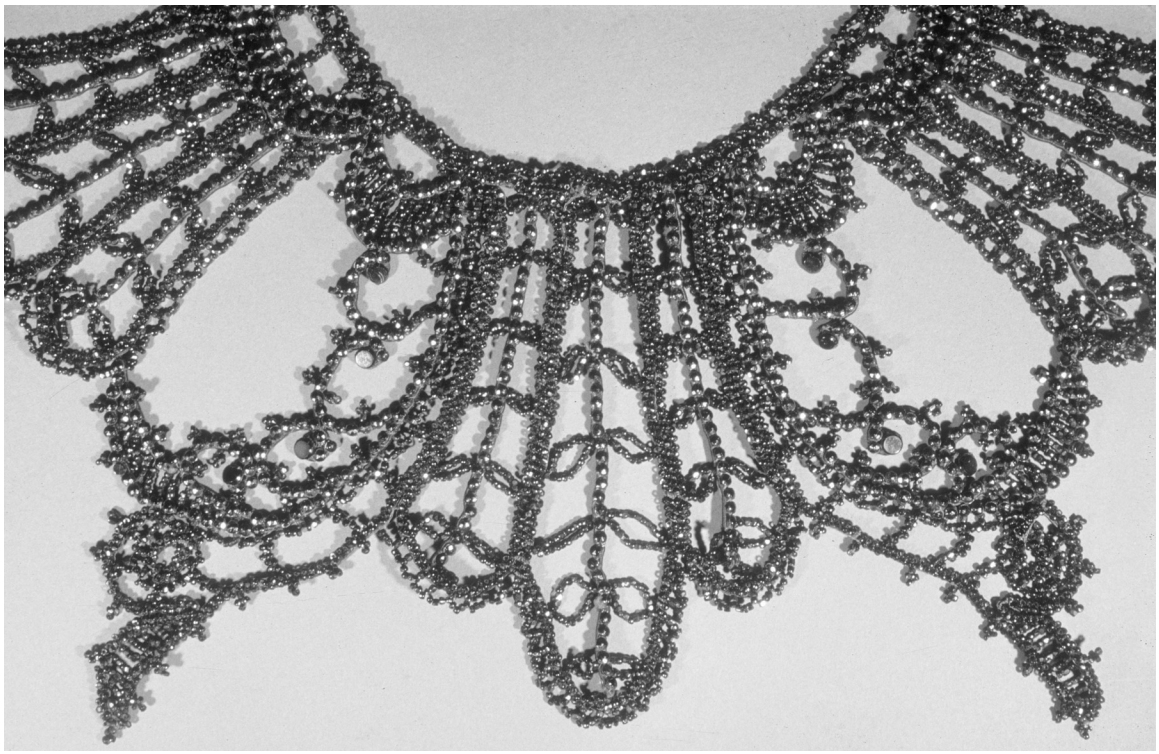

Figure 42. Passementerie with little black beads and stones, probably late 19th century; height of the detail: ca. 15 cm (private collection, Vienna).

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).

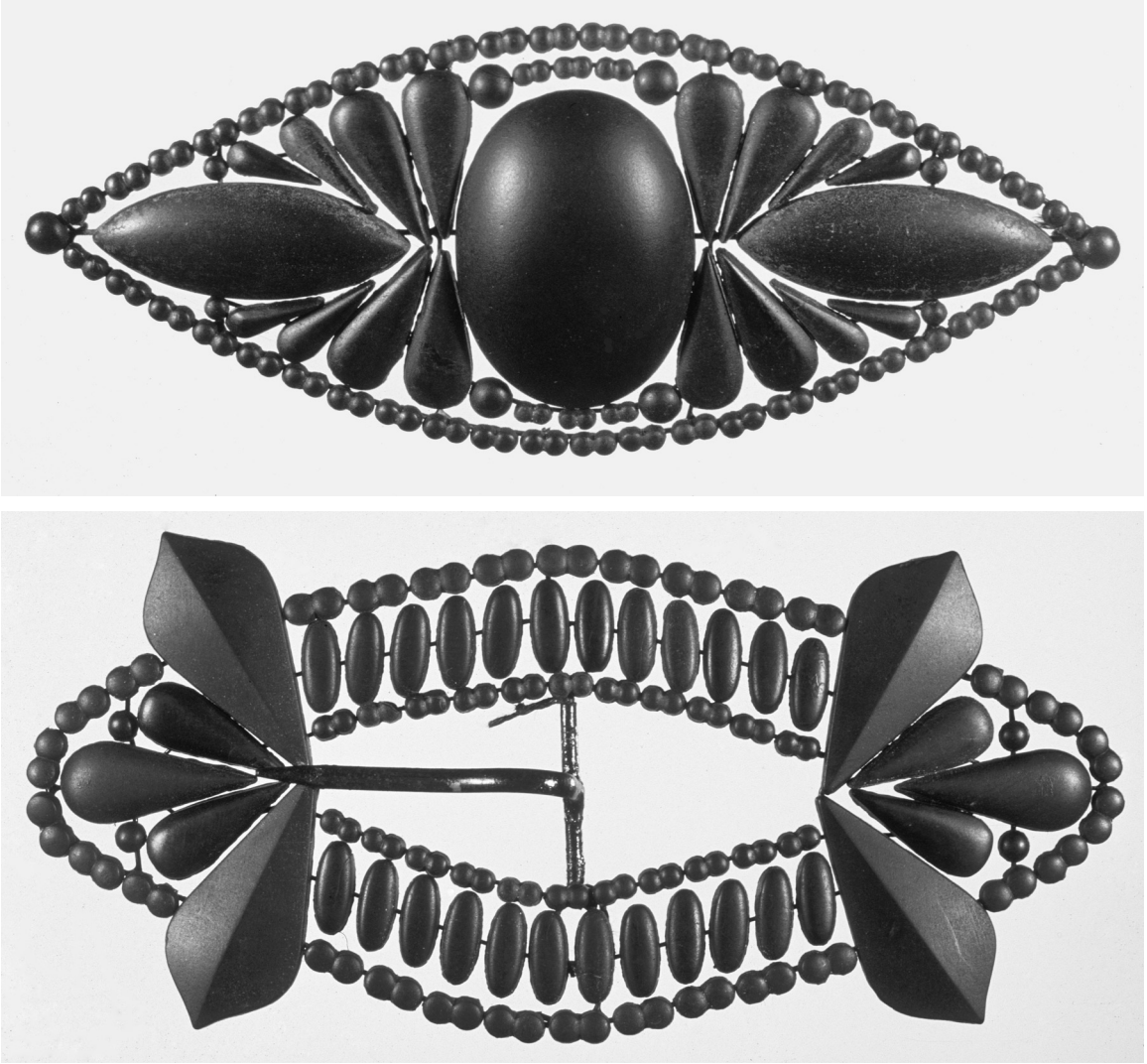

Figure 44. "Jet" brooches, late 19th century, Morchenstern; length: 11.7 and 12.0 cm (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).

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).

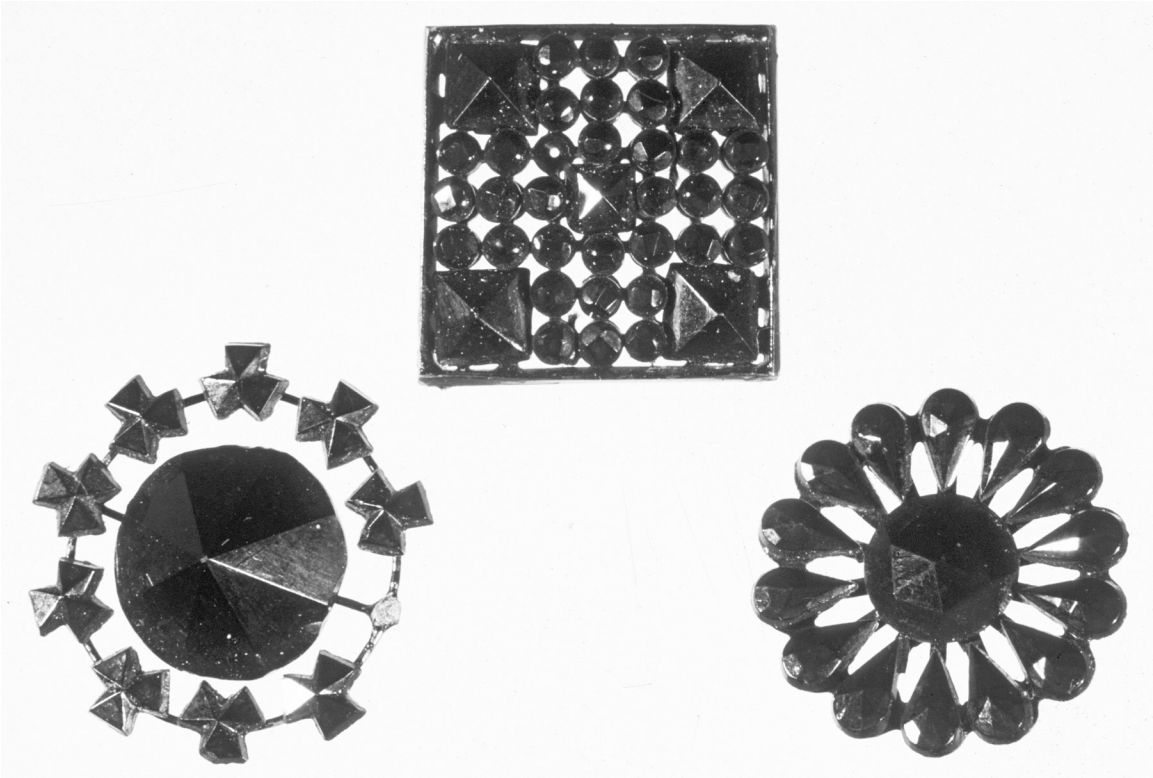

Figure 46. Black glass bijouterie ("jet"), probably late 19th century; square brooch: 2.7 x 2.7 cm (private collection, Vienna).

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.

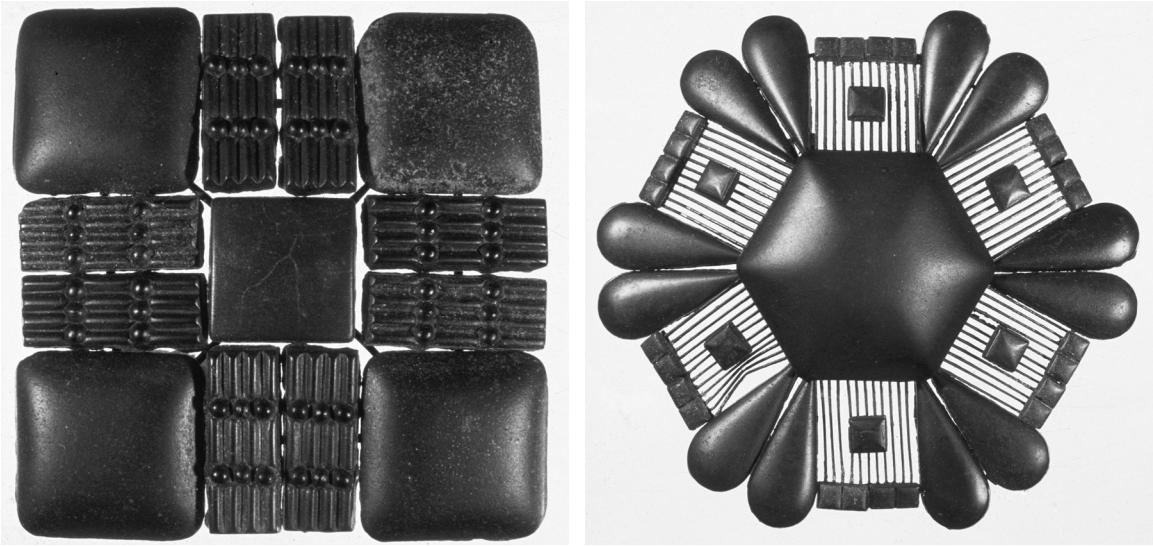

Figure 47. "Jet" brooches, late 19th century, Morchenstern; length: 11.3 and 12.5 cm (Gablonz Archive and Museum, Kaufbeuren-Neugablonz).