

BOHEMIAN GLASS BEADMAKING: TRANSLATION AND DISCUSSION OF A 1913 GERMAN TECHNICAL ARTICLE

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Initial translation by Barbara Pflanz

This report provides an English translation of a German technical article on late 19th-century and early 20th-century Bohemian glass-bead manufacturing, published in 1913 in the journal Sprechsaal. The article emphasizes the description of techniques for the manufacture of mould-pressed beads, secondarily describing methods for wound, blown and drawn-bead manufacturing.

INTRODUCTION

This is a translation and discussion of an article published in 1913 in the German technical journal *Sprechsaal* (Anonymous 1913a). A similar article also appeared in 1913 in *Keramische Rundschau und Kunst-Keramik* (Anonymous 1913b), but because of its brevity and similarity to the *Sprechsaal* version, it has not been included in this report. *Sprechsaal* was a semiannual technical publication created by Jacob Müller in 1868; while *Keramische Rundschau und Kunst-Keramik* was a ceramic-industry technical series. Unfortunately, neither article identified its author, the name of the manufactory, the region in Bohemia (presently western Czechoslovakia) where the manufactory was located, nor the dates for the original observations.

Disagreements in details between these articles are nonexistent. While the *Sprechsaal* article provides relatively expansive information, the *Keramische* article is brief. Minor variations do exist in the choice of technical terms used, but the differences are minor. Both articles were probably written by the same author; however, the *Keramische* article could have been authored by a second writer extracting information directly from *Sprechsaal*. Because of the similarity of terminology and conformity of subject

matter, information in both articles should be regarded as historically equivalent.

For reader evaluation, both the German version of the *Sprechsaal* article and its English translation are provided. Words with equivocal meanings are *italicized*, indicating precise technical equivalents were not found in 19th- or 20th-century German language dictionaries (*see* the References Cited section for sources consulted). Illustrations are reproduced as published, albeit at a different scale and with minor enhancements of faded lines. Paragraphs and sentences have been numbered to assist citation of specific portions of the document. Comments and insertions made by the author/translator are noted in square brackets, and original pagination is provided to assist proper attribution when sections are cited.

The primary purpose of this translation is to provide an historic context for the manufacture of mould-pressed beads observed by historical archaeologists on North American sites. Beads of this type were first encountered by the author in 1972 during an archaeological excavation of the Hudson's Bay Company's Fort Vancouver. This resulted in an initial description of the bead type as a "mandrel wound" bead with a composite hole formed by molding and punching (Hoffman and Ross 1973). Later, when more examples had been examined, identification of the bead type was modified to a "mandrel pressed" bead with a composite hole formed by moulding and punching (Ross 1974; 1976). Subsequent discussions with glass bead researchers resulted in the inclusion of this bead form within the broader manufacturing type identified as mould-pressed beads (Karklins 1982; Sprague 1985). Because of the unique attributes of early forms

of Bohemian faceted, spherical, mould-pressed beads (e.g., multiple-mould and glass seams, a punched hole, and moulded biconical holes), and because of the apparent evolution of this bead type throughout the 19th and 20th centuries, mould-pressed beads may

serve as temporal markers for dating archaeological sites (Ross 1989). Knowledge of pertinent historical documents is required to evaluate the chronology, and the following translation is provided to assist this endeavor.

Sprechsaal German Article (Anonymous 1913a)

English Translation

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**Von der Fabrikation der böhmischen
Glasperlen**

**Concerning the Manufacture of
Bohemian Glass Beads**

(Nachdruck verboten)

(reproduction prohibited)

[§1]

[§1]

[1.1] Die Glasperlenerzeugung in Böhmen hat sich namentlich von dem Jahre 1850 an, zuerst nur langsam, dann aber in den folgenden Jahren schneller entwickelt.

[1.1] Glass bead production in Bohemia, particularly from 1850, developed slowly at first, then more rapidly in subsequent years.

[1.2] Zuerst wurden die Glasperlen nur in Eisenformengepreßt, die sehr primitiv von den Schlossern hergestellt waren (Figur A), und zwar die kleineren von Nr. 0-6 in *Doppelkappelformen* (2 Perlen nebeneinander), die größeren, von Nr. 7 an bis zu den größten Perlen, nur in einfachen *Kappelformen*.

[1.2] Initially, glass beads were merely pressed in iron moulds [i.e., tong moulds] fabricated in a very primitive fashion by metal workers (Figure A). The smaller of these beads (from Nos. 0 to 6) were pressed in *double mould plates*, whereas larger ones (from No. 7 up to the largest) required only single *mould plates*.

[1.3] Jeder Glaspresser konnte sich damals eine verdorbene Form durch Nachbohren mit einem *Rundbohrer* wieder selbst vorrichten.

[1.3] Every glass presser at that time was able to repair a worn out mould himself by re-boring it with a *ball burr*.

[1.4] Gepreßt wurde damals schon, wie heute noch, von ca. 3-3-1/2 cm starken und ca. 100-150 cm langen runden Glasstangen, die in einem eigens dazu erbauten *Druckofen* (Figur B) angewärmt und geschmolzen wurden.

[1.4] Round glass canes, approximately 3 to 3.5 cm in diameter and approximately 100 to 150 cm long, were employed at that time for pressing, and are still in used today. These canes were heated and melted in a *pressing oven* [i.e., an oven used by mould-pressed beadmakes to partially melt their glass canes] (figure B) that was built especially for this purpose.

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[§2]

[§2]

[2.1] Gearbeitet wird gewöhnlich von 2 oder 3 nebeneinander liegenden Glasstangen.

[2.1] Generally, the process involves using 2 or 3 glass canes lying next to one another.

[2.2] Sobald nämlich das Glas an dem vorderen Ende der Glasstange im Ofen geschmolzen ist, nimmt der Glaspresser die letztere aus dem Ofen, führt sie an die Form und preßt soviel Mal Perlen ab, als die erhitzte Partie noch [52/53] weich genug ist.

[2.3] Währenddessen ist bereits eine zweite Glasstange im Ofen soweit geschmolzen; der Presser legt die erste in den Schmelzofen zurück und nimmt die zweite, um wieder Perlen abzapressen.

[2.4] Dies wiederholt sich nun während der ganzen Arbeitszeit.

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[§3]

[3.1] Die gepreßten Perlen werden je nach ihrer Größe entweder in den Kühltopf im oberen Kühlraum des *Druckofens* oder in einen Behälter neben dem Ofen gegeben.

[3.2] Sobald sie gekühlt sind, werden sie in einem länglichen schmalen Sack aus roher Leinwand geschüttelt, die Glasbrocke fällt ab, und die Perlen sind rein.

[3.3] Früher wußte man noch nicht, daß die Perlen mit einem ganz durchstochenen Loch erzeugt werden könnten; der etwas konisch gehaltene Stechdorn in der Form ging nur in die untere Hälfte der Perlenform in eine Vertiefung, die, wie nebenstehende Figur zeigt, nach außen eine Spitze bildete.

[3.4] Es mußten sonach die abgeschüttelten Perlen jede einzeln mit einem Dorn durchgeschlagen werden, damit der *Pitzelansatz* weg sprang, dann war erst die Perle beiderseitig offen.

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[§4]

[4.1] Diese Rohperlen wurden dann entweder eckig geschliffen in den verschiedenartigen Schliffarten, oder nur in dem Verwärmofen (Figur D) verschmolzen, so daß der Brockenrand an den Perlen glatt und rund wurde.

[2.2] As such, as soon as the glass on the front end of the cane in the oven has melted, the glass presser removes the latter from the oven, takes it to the mould and presses off as many beads as the softness of the heated portion will allow.

[2.3] In the meantime, a second glass cane in the oven has melted sufficiently; the presser places the first cane back into the melting oven, takes the second one, and again presses off beads.

[2.4] This process is repeated during the entire work period.

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[§3]

[3.1] Depending upon their size, the pressed beads are placed either in a cooling pot in the upper cooling chamber of the *pressing oven* or in a container next to the oven.

[3.2] As soon as they have cooled, they are placed in a long narrow sack, made of rough linen, and are shaken. The glass fins fall off, and the beads are clean.

[3.3] In these earlier times, it was not yet realized that beads could be made with a hole completely through them. In the mould there was a somewhat conically-shaped pin that penetrated only the lower half of the bead mould, entering a hollowed-out section which then, as the adjacent figure [Figure 1] shows, then formed a pointed protrusion on the opposite side.

[3.4] After the beads had been shaken, they had to be pierced individually with a pin, causing the *nipple-like extension* to detach. Not until then was the bead open on both sides.

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[§4]

[4.1] These unfinished beads were then either angularly ground, using one of the various cutting methods, or merely fire-polished in the warming oven (Figure D), so that the irregular exterior of the beads became smooth and round.

[4.2] Das Verschmelzen geschah damals in folgender Weise auf der sogenannten (sic: sogenannten) Verwärmerscheibe (Figure C).

[4.3] Diese besteht aus einem etwa 1 cm starken Eisenteller von 25 cm Durchmesser, auf dem Eisenstifte angebracht sind, die nach der Spitze zu etwas konisch verlaufen.

[4.4] An der Unterseite des Tellers befindet sich ein Eisenstab von 1 m Länge, der im Mittelpunkt des Tellers angeschraubt ist.

[4.5] Bei Beginn der Arbeit wurden zuerst die Eisenstifte durch Einführen der Verwärmerscheibe in den Ofen stark erhitzt, dann in einen Topf getaucht, worin sich eine dickflüssige Mischung von Kalk oder Ton befand.

[4.6] Von dieser legte sich eine feine Schicht an den Stiften an, worauf man die Kochperlen auf die Stifte aufsteckt und die Verwärmerscheibe in die obere Vorwärme des Ofens brachte. (Figure D).

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[§5]

[5.1] Nachdem die Perlen genügend vorgewärmt waren, nahm der Arbeiter die Scheibe in die untere Schmelzhalle.

[5.2] Vor dem Ofen war ein Eisenstab angebracht, der oben eine gebogene Führung hatte, worin der Stab der Verwärmerscheibe zu liegen kam.

[5.3] In dem Ofen wurde nur trockenes langgespaltenes Holz geschürt, das eine reine Flamme erzeugte und die Perlen auf den Stiften der Scheibe umspülte.

[5.4] Hierbei drehte man die Scheibe fortwährend langsam, damit sich alle Perlen gleichmäßig verrundeten.

[5.5] Bei einem gut geheizten Ofen war das Abrunden und Verschmelzen des Brockenrandes sehr schnell fertig.

[5.6] Wenn der Arbeiter die Perlen auf den Stiften für gut befand, so hob er die Scheibe aus dem Ofen und legte sie auf ein nahes Gestell zum Abkühlen.

[4.2] At that time, fire-polishing was accomplished on a so-called warming disk (Figure C) using the following method:

[4.3] This warming disk consisted of an iron plate approximately 1 cm thick and 25 cm in diameter. Iron pins with points of a somewhat conical shape were mounted on this disk.

[4.4] On the underside of the disk is an iron stem, 1 m in length, which is screwed onto the center of the disk.

[4.5] At the beginning of the process, the iron pins were first intensely heated by placing the warming disk into the oven. The disk was then dipped into a pot containing a thick liquid mixture of lime or clay.

[4.6] The pins were thus coated with a fine layer of this mixture, whereupon heated beads were pushed onto the pins and the whole warming disk was placed in the upper warming chamber of the oven (Figure D).

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[§5]

[5.1] After the beads had been heated sufficiently, the worker placed the disk in the lower melting chamber.

[5.2] An iron rod was mounted in front of the oven. At its upper end this rod had a curved guide into which the rod of the warming disk could be placed.

[5.3] Because it produced a clean flame which enveloped beads placed on the pins of the disk, only dry wood, split lengthwise, was burned in the oven.

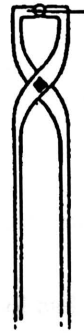
[5.4] During this process, the disk was rotated constantly and slowly, so that all beads were rounded evenly.

[5.5] With a well-heated oven, fire-polishing and rounding off of the irregular exteriors could be accomplished quickly.

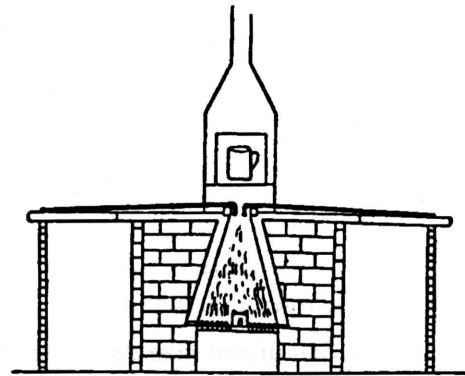
[5.6] As soon as the worker determined that the beads on the pins were ready, he removed the disk from the oven and laid it on a nearby stand for the cooling-off process.



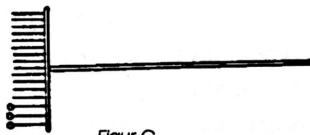
Figure 1.



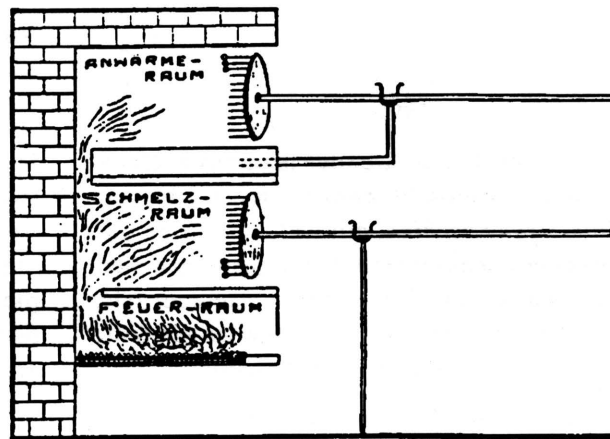
Figur A.
Figure A.



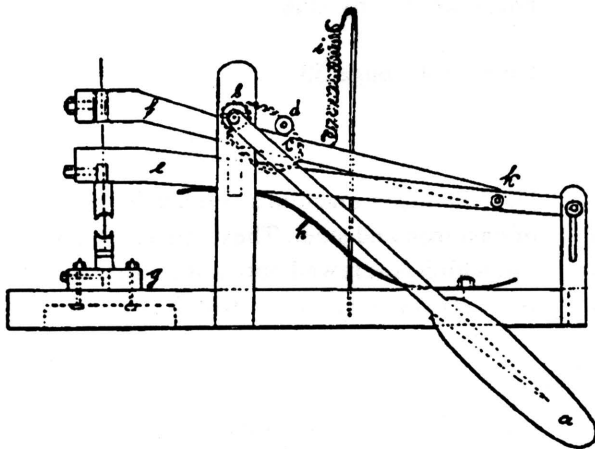
Figur B. Druckofen-Durchschnitt.
Figure B. Pressing Oven - Cross-section



Figur C.
Figure C.



Figur D. Vorwärmofen, Durchschnitt.
Figure D. Warming Oven, Cross-section



Figur E. Stechmaschine, Seitenansicht.
Figure E. Piercing Press, Side view

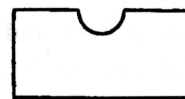


Figure 2.

[5.7] Sobald die Perlen etwas gekühlt waren, wurden sie durch Anschlagen mit einem kurzen Eisenstab an die Scheibe zum Abfallen in einen großen Topf, der mit Holzasche gefüllt war, gebracht und nach erfolgter Abkühlung geputzt und angefädelt.

[5.8] Früher hatte man noch keine mit Schliffecken und *Gravierungen* versehene gepreßte Perlen, während man es im Laufe der Zeit durch fortwährende Verbesserungen an Formen und Maschinen zu den vollendetsten Erzeugnissen gebracht hat.

[5.9] Schon längere Zeit nimmt man den besten Stahl und das beste Nickelmetall für Formen und *Einsetzkappel* für die Maschinen, so daß die gepreßten Perlen und *Façonsachen* wie geschliffen aus den Formen oder von den Maschinen kommen.

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[§6]

[6.1] Seit mehreren Jahren arbeitet man mit Preßmaschinen (Figur E), wovon es zwei Systeme gibt, und zwar die *Oberstechmaschine*, mit welcher Perlen und andere Artikel mit senkrechtem Loch gestochen werden, dann Seitenstechmaschinen, die wagerecht [sic: waagrecht] von der vorderen oder rückwärtigen Seite die Löcher in die zu pressenden Artikel sticht.

[6.2] Auf letzteren werden nur längliche verchiedenartig geformte Artikel, wie Oliven, Platten, rechteckige und runde flache Artikel mit längeren in beliebiger Zahl nebeneinander angeordneten Löchern gestochen.

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[§7]

[7.1] Die Preßmaschinen (Figur E) sind kräftig aus Eisenguß und Stahl gebaut und bestehen aus dem Druckhebel a, welcher an der Welle b festgeschraubt ist; an letzterer befindet sich ein Exzenter c und an diesem ein kleines Rädchen d.

[7.2] Ferner sind der Preßhebel e, in den das obere *Formenkappel* eingeschraubt ist, und der Stechhebel f, welcher bei k in dem Preßhebel lagert, vorgesehen.

[5.7] As soon as the beads had cooled somewhat, they were loosened by rapping the disk with a short iron rod. This caused them to fall off into a large pot filled with wood ashes, and after further cooling they were cleaned and threaded.

[5.8] Formerly, beads with ground facets and *relief designs* were not pressed; but through time, continual improvements in moulds and machines made it possible to produce almost perfect creations.

[5.9] It has long been customary to use the best steel and the best nickel for the moulds and *inset mould plates* of the machines, so that pressed beads and *other moulded articles* came out of these machines as if they were cut.

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[§6]

[6.1] For the last several years, pressing machines of two different types have been used (Figure E): 1) a *vertical piercing machine*, with which beads and other articles requiring a perpendicular hole could be pierced, and 2) lateral piercing machines, which pierce holes horizontally from the front or rear of the article being pressed.

[6.2] Only elongated, irregularly-shaped articles, such as olive-shaped and platter-shaped, rectangular and round-flat articles, were placed in the latter machines and pierced with an optional number of longer holes set side by side.

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[§7]

[7.1] Pressing machines (Figure E) are sturdily-built of cast iron and steel. They consist of a pressure level (a), which is screwed onto a shaft (b); and on the latter is an eccentric (c), upon which is a small rowel (d).

[7.2] In addition, there is also the pressing lever (e) into which the upper *mould plate* is screwed, and the piercing lever (f), which is attached to the pressing lever at (k).

[7.3] In dem Stechhebel sind die Stahlnadeln zum Stechen eingeschraubt und unter dem Preßhebel e ist eine flache Stahlfeder angebracht, während an dem Stechhebel f sich eine Spiralzugfeder befindet.

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(§8)

[8.1] Der untere Teil der Maschine besteht aus einer verschiebbaren Eisenplatte g, in welcher das untere *Formenkappel* mit einer Schraube befestigt ist.

[8.2] Dieses untere *Formenkappel* wird mit dem oberen sehr genau in eine Richtung gebracht, worauf die Stechnadeln eingesetzt werden; nun ist die Maschine zum Arbeiten fertig.

[8.3] Das Pressen geschieht nun folgendermaßen: Der Arbeiter (Glasdrucker) führt in der rechten Hand den Druckhebel a, in der linken hält er die geschmolzene Glasstange, bringt sie aus dem Ofen an die *Formenkappeln*, drückt dann kräftig den Druckhebel nach abwärts und wiederholt dies eben so oft, als das an dem vorderen Ende der Glasstange geschmolzene Glas noch weich ist und sich verarbeiten läßt.

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[§9]

[9.1] Beim Abwärtsdrücken des Druckhebels a drückt der Exzenter c auf den Preßhebel e und das kleine Rädchen d an dem Exzenter auf den Stechhebel f.

[9.2] Durch den Druck schließen sich die beiden *Formenkappeln* genau zusammen und formen die Perlen oder sonstigen Artikel; beim Aufheben des Druckhebels drückt die Stahlfeder h den Preßhebel in seine frühere Lage zurück, während die Spiralzugfeder i den Stechhebel zurückzieht.

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[§10]

[10.1] Die Hauptfabrikation auf diesen Maschinen bilden die eckig geformten, sogenannten englischen Schlifperlen und die Rundperlen.

[7.3] Steel needles are screwed into the piercing lever for piercing. Fastened under the pressing lever (e) is a flat steel spring [h], whereas on the piercing lever (f) is a coiled draw-spring [i].

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[§8]

[8.1] The lower section of the machine consists of a moveable iron plate (g), on which a lower *mould plate* is fastened with a screw [apparently with two screws; see illustration].

[8.2] This lower *mould plate* is brought precisely into line with the upper one, into which the piercing needles are inserted. Now the machine is ready to be used.

[8.3] Pressing is conducted in the following manner: The worker (glass presser) takes the pressure lever (a) into his right hand; in his left he holds the melted glass cane, which he takes out of the oven and brings to the *mould plates*. He then presses forcefully down on the pressure lever and repeats this process as long as the melted glass on the front end of the glass cane is still soft and can be worked.

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[§9]

[9.1] As the pressure lever (a) is pressed down, the eccentric (c) presses on the pressing lever (e); and the small rowel (d) on the eccentric presses on the piercing lever (f).

[9.2] As a result of this pressure, the two *mould plates* close together precisely; and the beads or other articles are moulded. When the pressure lever is released, the steel spring (h) pushes the pressing lever back into its former position, while the coiled draw-spring (i) pulls the piercing lever back.

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[§10]

[10.1] These machines are used primarily to mould angular, so-called, English cut beads and round beads.

[10.2] Die englischen Schliffperlen werden zumeist nach dem Pressen von den Glasbrocken durch Schütteln befreit, worauf man sie in einem kleinen Polierofen auf Tontellern nachpoliert.

[10.3] Auch werden bessere Qualitäten erzeugt, indem man die gepreßten Perlen an ca. 4-5 m lange schwache Messingdrähte anfädelt und an dem feinem Brockenrand auf Schleifrädern einige Schliffecken schleift, die dann eben auch im Polierofen poliert werden.

[10.4] Es werden auch von vorgeformten oder von runden gepreßten Perlen ganz feine Perlen geschliffen, die man dann entweder im Polierofen oder aber auf der Zinnscheibe poliert.

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(§11)

[11.1] Die Rundperlen bilden einen großen Teil der Fabrikation; sie werden in den Maschinen gepreßt, wie die englischen Schliffperlen und zwar bis zur Größe von 6 mm in *Doppelkappeln*, die größeren in einfachen *Formenkappeln*.

[11.2] Diese Perlen werden ebenfalls nach dem Pressen abgeschüttelt und durch Sieben von den Glasbrocken gereinigt.

[11.3] Dann kommen sie behufs Glattschleifens in eine Trommel aus Holz oder Eisen, in welcher etwas Wasser mit feinem Sand sich befindet.

[11.4] Diese gefüllte Trommel wird mit kraftantrieb in langsame drehende Bewegung versetzt; in einigen Stunden sind alle Perlen schön glatt abgerundet, und von dem feinen Brockenrand ist nichts mehr zu sehen. [53/54]

[11.5] Hierauf werden sie entweder in einer Pappelholztrommel, in welche etwas Tripelmehl und Wasser gegeben ist, durch langsames Laufen der Trommel oder in einem kleinen Polierofen auf Tontellern poliert.

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(§12)

[12.1] Derartige Perlen werden aus den verschiedenartigsten Glasstangen erzeugt und zuweilen auch mit Farben dekoriert, z. B. mit Iris-, Gold-, Silber-, Lüster- und Bronzefarben.

[10.2] After the pressing operation, the English cut beads are generally freed of glass fins by shaking. Then they are repolished on clay plates in a small polishing oven.

[10.3] Higher quality is obtained when the pressed beads are threaded on long thin brass wires, approximately 4 to 5 m in length; and using a cutting wheel, several angular corners are cut on the fine broken edges. These angular cuts are then also fire-polished in the polishing oven.

[10.4] Very fine beads are also cut from preformed [prefaceted ?] or from round pressed beads. There are then polished either in a polishing oven or on a tin case.

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[§11]

[11.1] Round beads constitute a major portion of production. They are pressed in machines, like the English cut beads, up to a size of 6 mm in *double mould plates*, with larger ones in *single mould plates*.

[11.2] These beads are likewise shaken after the pressing process, and are freed of glass fins by passing them through sieves.

[11.3] To give them a smooth polish they are placed in a drum made of wood or iron, in which there is a mixture of fine sand and water.

[11.4] This power-driven, filled drum is started up and runs with a slow rotating motion. Within several hours, all the beads are beautifully rounded and smooth; and no trace of the fine mould seam can be seen. [page 53/page 54]

[11.5] Hereupon, the beads are placed either in a drum made of poplar wood, in which there is some rottenstone flour and water, and are polished as the drum rotates slowly; or they are polished in a small polishing oven on clay plates.

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[§12]

[12.1] Beads of this style are produced from different types of glass canes and are occasionally also decorated with colors; for example, with iridescent, gold, silver, luster and bronze colors.

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[§13]

[13.1] Die sogenannten Lampenperlen werden auf Lampentischen, an welchen sich unterhalb der Tischplatte ein Blasbalg befindet, an einer Gas- oder Kaiserölstichflamme gearbeitet.

[13.2] Das Glas in schwächeren Stengeln wird in der Stichflamme geschmolzen und auf Stahlnadeln, welche in Kalk- oder Tonwasser getaucht sind, aufgewickelt und zwar in der beliebigen Stärke einer Perle.

[13.3] Noch im ziemlich weichen Zustand wird dann die angewickelte Perle in einer habrunden Form (nebenstehende Abbildung) etwas nachgedreht.

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[§14]

[14.1] Die Herstellung der Lampenperlen ist eine ganz andere, als die der Preßperlen, und es werden sehr schöne Muster gearbeitet.

[14.2] Auf denselben Tischen werden auch die Hohlperlen und hohle *Fassonsachen* angefertigt, und zwar aus hohlen Glasstengeln, welche in der Stichflamme an dem vorderen Ende zum Schmelzen gebracht werden.

[14.3] Es werden runde, ungeformte, auch Einlochperlen, dann geformte Perlen gemacht, welche mittels Blasmaschine in Messing- oder Nickelformen geblasen werden, je nach der Größe von 1-15 Stück auf einmal in einer Form.

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[§15]

[15.1] Zumeist werden diese geformten Hohlperlen mit salpetersaurem Silber und auch Chlorgold eingezogen und bilden einen sehr großen Exportartikel.

Nr. 4 - 54

[§16]

[16.1] Ferner sind die sogenannten Schmelzperlen, welche unter dem Namen *Doppelschmelz* für *Passementeriezwecke* verwendet werden, zu nennen.

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[§13]

[13.1] The so-called lamp beads [i.e., wound beads] are produced over a gas or "Kaiseröl" [a rectified petroleum fuel with a flash point of 90-140° F] jet flame on lamp tables, which have bellows attached underneath the table top.

[13.2] Glass, in the form of thin canes, is melted in a jet of flame. Using steel needles dipped in lime or clay water, melted glass is wrapped around the needles to the desired thickness of a bead.

[13.3] While the bead on the needle is still quite soft, it is rotated again slightly in a hemispherical mould (see adjacent illustration) [Figure 2].

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[§14]

[14.1] The production of lamp beads is a completely different process from that of pressed beads, and beautiful examples are being made.

[14.2] The same tables are used for making blown beads and mould-blown articles. These are made from hollow glass canes, which are melted on the front end in the tongue of the jet of flame.

[14.3] Round, freeform, also single-hole beads, and moulded beads are made and blown into brass or nickel moulds by means of bellows. Depending upon their size, 1 to 15 pieces at a time can be produced in a single mould.

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[§15]

[15.1] Most of the time these blown beads coated with nitrate of silver or muriate/protochloride of gold are withheld from circulation [i.e., withheld from local markets], and constitute a very significant export item.

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[§16]

[16.1] In addition, so-called blowpipe [or enamel] beads, used for *embroidery designs* under the name "*Doppelschmelz*" [double enamel?], should be mentioned.

[16.2] Diese Perlen werden von sechskantig gezogenen Glasstengeln auf Sprengmaschinen abgesprengt, dann entweder nur auf Tontellern im Polierofen verschmolzen oder an schwachen Messingdraht (4-5 m lang) gefädelt und an der Seite eines Schleifrades entweder zwei- oder dreimal geschliffen und darauf in dem Polierofen auf Tontellern poliert.

[16.3] Auch sind bereits für das Schleifen dieser Perlen Maschinen in Verwendung.

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[§17]

[17.1] Die zweite Gattung sind die runden Rocailleperlen.

[17.2] Diese werden ebenfalls, jedoch von runden, gezogenen Glasstengeln auf Sprengmaschinen abgesprengt und kommen dann nach diesem in einen eigens dazu erbauten Rollierofen zum Abrunden.

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[§18]

[18.1] Die Perlen werden erst in ein Gefäß gebracht, welches eine dickflüssige Kalklösung enthält, und so lange gerührt, bis sich die Löcher derselben mit Kalk gefüllt haben.

[18.2] Dann werden sie in eine Eisentrommel gegeben, in welcher sich gestoßene Holzkohle und Meeressand befinden; diese wird in den Rollierofen eingeführt und so lange über Holzfeuer gedreht, bis sich die Perlen verrundet haben.

[18.3] Dieses Verrunden dauert nicht lange; nach fertiger Verrundung wird die Trommel aus dem Ofen gehoben und der Inhalt auf große, flache Blechpfannen geschüttet behufs Abkühlens der Perlen.

[18.4] Nach dem Abkühlen werden die Perlen ausgesiebt und geputzt.

[18.5] Es werden dann die Löcher zumeist mit Silber und Gold eingezogen, auch vielfach mit anderen Farben dekoriert.

[18.6] Die Rundperlen werden sehr vielseitig verarbeitet; ihre Fabrikation stammt aus Venedig und ist erst im Jahre 1888 in Böhmen eingeführt worden.

[16.2] These beads are broken from drawn hexagonal glass canes using infernal machines. Then they are either merely fire-polished on clay plates in the polishing oven, or they are threaded onto fine brass wire (4 to 5 m long) and cut either two to three times on the side of a cutting wheel. After this they are fire-polished on clay plates in the polishing oven.

[16.3] Also, machines for cutting these beads are already in use.

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[§17]

[17.1] The second type are the round rocaille beads.

[17.2] These are likewise broken from glass canes, this time round-sectioned ones. After this, they are rounded off in a tumbler oven especially built for this purpose.

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[§18]

[18.1] The beads are first placed in a receptacle containing a thick lime solution and stirred until their holes have filled with lime.

[18.2] Then they are placed in an iron drum containing powdered charcoal and sea sand. This drum is put into the tumbler oven and rotated over a wood fire until the beads become smooth.

[18.3] This smoothing does not take long. After it is completed, the drum is lifted out of the oven and its contents shaken out into large, flat, tin pans for the purpose of cooling the beads.

[18.4] After they have cooled, the beads are sifted and cleaned.

[18.5] The holes are then usually coated with silver and gold, and are often also decorated with other colors.

[18.6] Round beads are made in various ways. Their manufacture originated in Venice and was first introduced into Bohemia in the year 1888.

DISCUSSION

Within the *Sprechsaal* article, four manufacturing types of glass beads are discussed:

- 1) Mould-pressed beads,
- 2) Wound beads,
- 3) Blown beads, and
- 4) Drawn beads.

The majority of the article focuses upon mould-pressed beads, treating the remaining three types as secondary. It is stated that Bohemian glass beadmaking developed slowly, particularly from 1850 (§ 1.1), suggesting that the industry is a 19th-century phenomenon. This observation appears false as stated, and may in fact reflect a 19th-century florescence of Bohemian mould-pressed-bead technology. Another temporal statement is that the manufacture of round, *rocaille* beads (§ 18.5 referring to § 17.1) originated in Venice, with an introduction to Bohemia in 1888 (§ 18.6). This late date may pertain to the manufacture of hot-tumbled, spherical, *rocaille* beads, but certainly not to the other round varieties of beads discussed (i.e., spherical, wound beads).

Previous historical researchers have provided adequate documentation for the early history of glass beadmaking in Czechoslovakia and Bohemia (*see* References Cited). Karel Hetteš (1958: 6, 9, 17) noted that glass jewels and buttons from the Moravian Empire existed in the 8th and 9th centuries, glass beads for rosaries were made on the Czech-Bavarian border in the 14th century, and Italian craftsmen had been employed by the 17th century.

In writing about the Jablonec region of Czechoslovakia, Zuzana Pešatová (1965) noted that the technical foundation for the glass-bead industry lay with the florescence of the artificial-jewelry industry. Replication of precious stones in glass was a major trade in Bohemia. By the mid-18th century, glass replicas were shaped initially with pressing tongs and finished by grinding. For the manufacture of minor glass articles, pressing tongs were in use even earlier:

The discoveries made by Dr. Hajdová of the Industrial Arts Museum in Prague during the archeological investigation of the glasswork at Rejdice in the Jablonec region include — for the period towards the close of the 16th and in

the early 17th centuries — a number of glass beads, both pressed and ground (in addition to beads and small buttons strung on wire) (Pešatová 1965: 25).

Mould-Pressed Beads (§§ 1.2-12.1)

Beads of this type were manufactured individually or in small batches (§ 1.2) using iron tongs (§ 1.2 and Figure A), and later, pressing machines with multiform moulds (§§. 5.8-5.9, 6.1-6.2 and Figure E).

If Czoernig can be believed in the twenties of the 19th century as many as about two and a half thousand million pieces were made for export alone. They were massive, full pearls, of considerable weight, with only a small hole perforated by means of the tongs in the course of the shaping operation (Pešatová 1965: 25).

Discussing developments in the Jablonec region during the 1820s and 1830s, Pešatová noted that:

... dies, metal craftsman's press and punch had been introduced in the Jablonec region, the manufacturers had learned how to fix pins onto brooches: the close of the thirties brought about a considerable increase in production as far as types of décors as well as shapes were concerned (Pešatová 1965: 27).

At least eight sizes (i.e., sizes 0-7) were made (§ 1.2), with each size denoted perhaps by its metric measurement. Comparing § 1.2 with § 11.1, it appears that bead sizes smaller than 6 mm (i.e., sizes 0-6) were made in double moulds. Thus, the largest small size, size 6, measured 6 mm. Perhaps size 1 beads measured 1 mm, and size 0 beads measured less than 1 mm. However, standard bead sizes may have been variable. Moulds were rebored when worn (§ 1.3), perhaps only slightly, or perhaps to the next larger size. Zuzana Pešatová (1965: 27) noted that one firm, F. Unger and Co. at Desná manufactured cut beads in 19 sizes.

In earlier periods (ca. mid-19th century), holes in these beads were not formed completely by the pressing process, and the remaining portion of the hole had to be pierced with a pin (§§ 3.3-3.4). Some glass articles (possibly including unique varieties of beads) could have multiple holes (§ 6.2). The fins (i.e., the

glass that escaped along the mould seam) were removed by abrasion and sieving (§§ 3.2 and 11.2), with better quality beads having their fins removed by grinding and fire-polishing (§ 10.3).

Mould-pressed beads could be plain, have facets or designs cut or moulded on their surface, or could be decorated with colors (§§ 4.1, 5.8-5.9, 12.1). The firm of F. Unger and Co. manufactured cut beads in about 200 subtly varied colors (Pešatová 1965: 27), and only in the field of cut pearls did North Bohemia have a monopoly (Pešatová 1965: 26).

Round beads were the most commonly manufactured (§ 11.1), and at least one special variety of faceted bead was made; i.e., English-cut (§ 10.1; pentagonal beads with three rows of facets). In the early history of this technology (perhaps the mid-19th century), facets and designs were cut by hand, not pressed by the mould (§ 5.8). Beads could be finished roughly by tumbling or finely by fire-polishing (§§ 4.1, 11.3 and 11.5).

Wound Beads (§§ 13.1-14.1)

Beads of this type were wound on steel wires dipped in lime or clay (§ 13.2). Once wound, the warm, still-plastic bead was rotated within a semicircular mould (§ 13.3 and Figure 2). This shaping would have resulted in the creation of a perfectly spherical bead with a smooth surface, lacking the small tail of glass typical of wound beads.

Blown Beads (§§ 14.2-15.1)

Beads of this type were made from hollow tubes, heated and either blown freeform or into metal moulds (§§ 14.2-14.3). They were decorated with gold and silver, and intended primarily for export (§ 15.1). Zuzana Pešatová (1965: 26) noted that:

Thin-walled hollow pearls blown in flame from a glass capillary tube have been in the Jablonec region since the last quarter of the 18th century. At first they were shaped only "off-hand" as balls, olives, pear shapes and the so-called "coques de perles" shapes, later on, since 1876, in a greater variety of profiles and more complex types also by using iron shapers with in-

serted heated tubes, this enabling the worker to produce whole rown of pearls at once. Their surface was either quite plain or decorated with a glass thread of another colour, either without inner coating or with one (paint, wax, essence d'orient, metal). In the fifties of the 19th century inside metal-coating achieved by the absorption of the silver nitrate was introduced by the Smrzovka physician Dr. Weiskopf. (The silver-coated pearl had originally been brought into the market by Paris makers but later on Jablonec managed to monopolize practically the whole of production while India was the chief buyer.) Yellow glass created a "gilded" effect.

Drawn Beads (§§ 14.2-18.6)

Two forms of drawn beads are mentioned: enamel beads (§§ 16.1- 16.3) and hot-tumbled, colored beads (§§ 17.1-18.6). Enamelled beads were probably chopped or incised and snapped from hexagonal canes, with additional facets ground on their ends (§ 16.2). Hot-tumbled, colored beads were cut from round canes, their holes were filled with a lime mixture, and the beads were smoothed by hot-tumbling in an iron drum with charcoal and sand (§§ 17.2 and 18.1-18.2). Upon cooling and cleaning, these beads were then colored by coating the interior surface of the hole with silver, gold and other colors (§ 18.5). Apparently, this type of bead was first made in Bohemia in 1888 (§ 18.6).

CONCLUSIONS

The *Sprechsaal* article provides an outstanding insight into a poorly documented 19th-century technology for the manufacture of mould-pressed beads. As an historical overview, it clearly identifies a general technology present in Bohemia during the late 19th and early 20th centuries, providing descriptions of a few of the variations employed to create holes and decorate bead surfaces. However, the descriptions contained herein fail to address many manufacturing variations employed in the early through mid-19th century and, as such, the article should not be regarded as a definitive statement on Bohemian mould-

pressed beadmaking technology. Further elucidation of the technology, its variations in formative and decorative methods, and its myriad bead varieties must await discovery of additional historical works and descriptions of beads from tightly-dated museum collections and archaeological sites.

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