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COST-SAVING MINTING TECHNOLOGY: RECURRENT OVERSTRIKING OF BRACTEATES

ABSTRACT: Leaf-thin bracteate coins were minted for several hundred years during the Middle Ages. The existence of hundreds of small independent currency areas with their own mints in central, eastern and northern Europe and the strong link between bracteates and periodic recoinage explain the large number of bracteate types. A special minting technology linked to goldsmithing technology was required to produce the bracteates. A soft material was placed under a flan, and the motif was created by bending the flan rather than pressing the motif into the flan. This study analyzes how bracteate technology could save costs in the minting procedure compared to traditional coinage technology. The bending characteristic of the bracteates together with the flat hammering of old bracteates imply that the size of the flan remained almost unchanged after recurrent overstrikes. Thus, the bracteate technology saved one of the costliest steps in the minting procedure: the time-consuming production of the flan. In contrast, overstriking of biface coins using the traditional coin technology could only be performed a few times, since it caused a stepwise thinner and larger flan. The latter phenomenon explains the existence of biface half-bracteates.

ABSTRAKT: Brakteaty na cienkich krążkach wybijano w średniowieczu przez kilkaset lat. Funkcjonowanie w Europie Środkowej, Wschodniej i Północnej setek małych, niezależnych stref obiegu z ich własnymi mennicami oraz silne powiązania między brakteatami a renowacją monety wyjaśniają dużą liczbę typów pieniądza brakteatowego. Do ich produkcji niezbędna była specjalna technika mennicza nawiązująca do złotnictwa. Pod krążek podkładano miękki materiał, a relief uzyskiwano bardziej przez odciśnięcie, niż wbicie. W niniejszym studium przeanalizowano w jaki sposób technika brakteatowa mogła obniżać koszty produkcji w porównaniu do tradycyjnej techniki menniczej. Tłoczenie brakteatów na rozklepanej starej monecie powodowało, że średnica krążka niemal nie zmieniała się mimo kolejnych przebić. Dzięki technice brakteatowej unikano zatem jednego z najbardziej kosztownych etapów w produkcji menniczej: czasochłonnego wytwarzania krążków. Natomiast przebijanie monet dwustronnych z wykorzystaniem tradycyjnej techniki menniczej mogło zostać wykonane tylko kilka razy, ponieważ skutkowało tym, że krążek stawał się cieńszy i większy. To ostatnie zjawisko objaśnia istnienie dwustronnych półbrakteatów.

KEYWORDS: bracteates, minting technology, overstriking, bending, soft material, leaf-thin flan, goldsmith, half-bracteates

SŁOWA KLUCZOWE: brakteaty, technika mennicza, przebicia, odciskanie, miękki materiał, cienki krążek, złotnictwo, półbrakteaty

1. Introduction

In central, eastern, and northern Europe, approximately ten thousand types of uniface silver coins called bracteates were struck in the period 1140–1520.[1] Bracteates are not only the thinnest and most fragile coins in monetary history, but could also have an extraordinarily high artistic style – at least in the 12th century. To produce such fragile coins that could function as a medium of exchange in the market, a specific minting technology was required that was completely different from the traditional technology used to strike biface coins. Only one die was used, and a piece of soft material, such as leather or lead, was placed under a thin flan (planchet) so that the mirror image of the design on the obverse appeared on the reverse of the bracteates (Fig. 1).[2] The thin flan and the soft material link bracteates to traditional goldsmithing technology.[3]

The large number of bracteate types can be explained by the presence of hundreds of small independent currency areas with their own mints in central, eastern and northern Europe, as well as the strong link between bracteates and periodic recoinage: a monetary taxation system. Under periodic recoinage, old coins were frequently declared invalid and had to be exchanged for new ones based on publicly announced exchange fees and dates. Such recoinages were recurrent. In the 12th and 13th centuries, recoinage could occur once or twice per year in Germany and central Europe, and a common exchange fee was four old coins for three new

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[1] The Latin expression *bractea* (which means "thin piece of metal") for these uniface coins was used for the first time in a document from 1368 (Höfken 1886:VI). At the end of the 17th century, the term "bracteates" began to be used for these uniface coins in scientific publications (Olearius 1694). The first bracteates were struck in Thuringia and Saxony-Meissen in the 1120s. However, a breakthrough for bracteates occurred in the 1140s. Bracteates in the form of *hohlheller* were minted as small change in Rhineland-Westphalia until the beginning of the 17th century.

[2] Kühn 2000, pp. 2ff. The diameter of bracteates varies from 10 to 50 mm, and the weight is between 0.05 and 1.00 g. Bracteates are only 0.05–0.20 mm thick, but they are often stabilized by a high relief. A common misunderstanding is that all uniface coins are bracteates. Uniface coins that have not been minted through the specific technology of using soft materials under a flan are not called bracteates.

[3] For further discussion, see section 3.3.

Fig. 1. A bracteate with a mirror image on the reverse. *Brunswick*, Duke Henry the Lion (1142–95); Ø 27 mm, scale 1.5:1

ones.[4] Bracteates were well suited for a system with frequent renewals.[5] First, the relatively large diameter of bracteates (up to 50 mm) made it possible to display various images on the coins, allowing valid and invalid coins to be quickly and reliably distinguished. Second, only one die was needed, and this die lasted longer than traditional dies.

There is also a third argument for why bracteates are closely linked to periodic recoinage. In the literature, it has been claimed that bracteates were more frequently overstruck than biface coins.[6] Minting traces from the bracteates themselves show that they were often overstruck.[7] Furthermore, coin hoards with bracteates contain flat-hammered bracteates that have still not been reminted.[8] In the bracteate hoard from Grünroda with ca. 1,500 bracteates, Schwinkowski particularly analyzes whether bracteates have been overstruck and if there are traces from an old type.[9] He finds such traces for more than 200 bracteates in the hoard.[10]

Time- and cost-saving overstriking would be especially practical if recurrent reminting of coins occurred. However, nobody has ever explained or shown why bracteates were easier to overstrike than biface coins produced through traditional minting

[4] Kluge 2007, pp. 61ff; Röblitz 1986, p. 21. Both the frequency and the exchange fee of coin renewals varied across Europe; for more information, see Svensson (2016, pp. 1112ff).

[5] Svensson 2016, p. 1123

[6] Kluge 2007, p. 50.

[7] Dobras 2005, p. 9.

[8] Gaettens 1957, plates 2–5; Buchenau, Pick 1928.

[9] Schwinkowski 1909.

[10] In the Grünroda hoard, Bohemian bracteates of King Ottokar I have been overstruck by bracteates issued by the Margraves of Meißen. However, only in 1 (!) case (of ca. 200), Schwinkowski could exactly identify the old type under the new type. For most cases, one needs a magnifier to identify overstrike traces.

technologies. In the present study, the main purpose is to explain why the characteristics of bracteates made them easier to overstrike than traditional biface coins. However, before analyzing overstriking, the differences between, as well as pros and cons of, the bracteate technology and the traditional minting technology must be discussed.

The study is organized as follows. A comparison between traditional coin technology and bracteate technology is presented in section 2. In section 3, the organization of work for bracteate minting and the link between bracteate and goldsmithing technology are discussed. Overstriking of bracteates and biface coins are analyzed in section 4. The final section concludes the discussion.

2. Traditional coin technology vs. bracteate technology

The left side of Fig. 2 shows traditional coin-striking technology. With traditional technology, both the lower and upper dies are normally engraved. However, to simplify comparison with the bracteate technology, in this picture, only the lower die is engraved, and a flat cylinder is used instead of an upper die. Two important observations for traditional coin-making are that, before the coin is struck, 1) the flan is thicker than the deepness of the engraved lower die, and 2) the flan is made of a softer material (silver) than the die. When the hammer hits the cylinder, the flan is compressed and fills the gap in the engraved lower die. Part of the force through the flan spreads in a horizontal direction. The result is a coin that is thinner and has a larger diameter than the original flan and a flat reverse. If an upper die is also used, both sides of the coin show a motive, with the same effect on the thickness and diameter of the coin.

On the right side of Fig. 2, bracteate technology is depicted. Both technologies use the same lower die, engraving and upper cylinder. However, the engraving is deeper than the thickness of the bracteate flan. Furthermore, a soft material, such as lead or leather, is placed between the thin flan and the cylinder. The silver flan is harder than the soft material. When the bracteate is struck, the soft material is compressed, and some of the force spreads in the horizontal direction. The soft material increases in diameter and becomes thinner.[11] If the hammer strike has enough power, the silver flan will bend and fill the gap in the engraved die. The thickness of the flan is unchanged.[12] Therefore, the diameter of the bracteate becomes smaller than that of the original flan. Since the flan is thinner than the deepness of the engraving, a mirror image of the engraving will appear on the reverse of the bracteate. Thus, in both technologies, it is the softest material (flan in traditional technology and soft material in bracteate technology) that becomes thinner and increases in diameter. In bracteate technology, the motif is not pressed into the flan. Instead, the bracteate gets its motif by the bending of the flan.

[11] Kühn 2000, p. 2.

[12] Kühn 2000, p. 2.

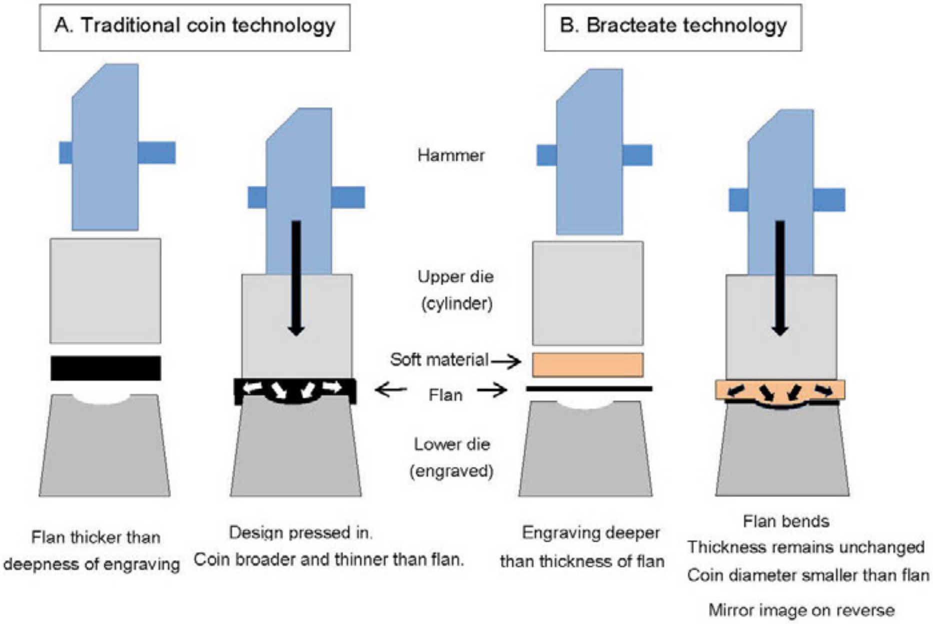

Fig. 2. Difference between traditional coin and bracteates technologies

3. Origin and organization of bracteate work

3.1. A bracteate die lasts longer

As shown in Fig. 2, the lower die rather than the upper die is engraved when striking bracteates. This is intentional. Striking biface coins destroys the upper die more frequently than the lower one. It is the top part (which is not tempered) of the upper die where the hammer hits that is typically damaged. This damage occurs because of the impact of the hammer and the recoil upwards that follows. Many die-link studies from the Viking Age confirm that there are two to three upper dies for every lower die used to strike biface coins.[13] Thus, when striking bracteates, it is economical to use an engraved lower die and a flat cylinder as the upper die, as it is far cheaper to produce a new cylinder than an engraved die. This conclusion is also empirically supported by the fact that almost all preserved bracteate dies are lower dies.[14]

A lower bracteate die will last longer and can strike more coins than a lower die for biface coins for two reasons. First, the soft material cushions the hammer strike, and the recoil is smaller. Second, the thin silver flan and the soft material require a markedly less powerful strike. The cheap bracteate technology is therefore

[13] Malmer 2010, pp. 43ff.

[14] Svensson 2013, p. 128.

practical and economical if many coins must be struck in a short period. Thus, it is no surprise that the golden years of bracteate technology and periodic recoinage coincided, as mentioned in the introduction.

3.2. Organization of work

European bracteates were struck from the obverse with a negative die, i.e., the engraved die had a mirror image of the design.[15] The sequential organization of work when striking bracteates was similar to that of biface coins:[16]

1. The correct alloy of silver was created;
2. The silver was molded in forms or ingots;
3. The silver was hammered into rods with appropriate thickness;
4. The circular flan was punched or cut out from the rods;[17] and
5. Finally, the bracteate was struck (see right panel of Fig. 2).

In the German literature, it has been assumed that circular flans were cut out with a pair of scissors or punched out with a tool from the hammered silver rods in step 4.[18] However, waste materials from bracteate minting in Sweden and Norway tell another story: some bracteates were struck on the silver rod before they were punched out.[19] This procedure has not been confirmed for German bracteates.

Silver was the only precious metal used for bracteates until approximately 1500. However, it was not feasible to use 100 percent silver, since the bracteates would be too soft and would quickly wear down or bend once in circulation. A base metal such as copper or nickel was therefore mixed with the silver. German bracteates from the period 1120–1290 normally had a silver fineness of 85–95 percent.[20]

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[15] There are a few exceptions; some of the earliest German bracteates were struck from the reverse with a positive die.

[16] Kluge 2007, pp. 49ff.

[17] However, there were some variants of this procedure. Some bracteates were struck on squared flans, e.g., in Breisgau (southwestern Germany) and northern Switzerland. The squared bracteates were then given rounded edges, since the die was circular. An advantage was that it was easier to cut out squared flans than circular ones. However, a disadvantage was that bracteates on squared flans more easily cracked in the corners when in use.

[18] Kühn 2000, p. 13; Kluge 2007, p. 49. Jäggy and Schmutz (1998) suggest another method for the production of bracteate flans in the 14th century. The silver was molded in long rectangular ingots ("König"). These ingots were divided into small cubes of the necessary weight. The small silver cubes were then hammered out to perfect circular flans, and non-even circular parts were cut off. The problem with this method of producing flans is that it would have had a high production cost. For economic reasons, this method is therefore rejected. In the present paper, I take the opposite view, namely, that bracteates were produced because the technology was inexpensive. Thus, it is more likely that the silver was hammered out into large silver rods with the appropriate thickness.

[19] Gullbekk 1996, pp. 186ff; Golabiewski Lannby 2016, pp. 168–169.

[20] Bracteates of pure copper were struck in some mints in northern Germany (e.g., Rostock) in the 16th century. Today, bracteates made from gold are sold on the collector market, but they are regarded as modern forgeries because gold bracteates have never been found in any coin hoard.

Since silver is a soft metal, and the flans were leaf-thin (some as thin as 0.05–0.10 mm), bracteates were coined without warming up the flan.[21] Meding argues that annealing would probably destroy or bend the leaf-thin flan. A disadvantage with cold-hammered coins – especially if they are thin – is the risk of planchet cracks. Such cracks are common on medieval bracteates, particularly on those from Saxony and Thuringia with a thickness of 0.05–0.10 mm.

3.3. Links to goldsmithing technology

The first European bracteate coins were minted in Thuringia and Saxony-Meissen in the 1120s, but bracteates were not a new phenomenon. Indian bracteate coins were minted in the 7th and 8th centuries, but it is highly unlikely that the German mint masters of the Middle Ages were acquainted with them.[22] However, by the 12th century, the technique of punching designs in thin flans of precious metal against a soft material when producing jewelry bracteates had been known for several hundred years among goldsmiths and silversmiths in central and northern Europe.[23]

Fig. 3. Half-bracteate, where obverse and reverse designs are superimposed on each other. *Worms*, Bishop Burchard II (1120–49); Ø 28 mm, scale 1.5:1

At the end of the 11th century, half-bracteates began to be struck in Germany – thin, biface coins on which the obverse and reverse designs were superimposed (Fig. 3). W. Haupt and R. Besser, H. Brämer, V. Bürger argue that these

[21] Meding 2006, p. 48.

[22] Indian bracteates were relatively large, 50–60 mm in diameter, and weighed 5–6 g, considerably more than the German bracteates, which weighed at most 1.0 g. Further, Indian bracteates were struck with a positively engraved die from the reverse, in contrast to the German bracteates, which were struck with a negative (mirrored) die from the obverse.

[23] Jewelry bracteates were produced by goldsmiths in the 6th and 7th century in northern Europe. These ornaments were almost always made of gold and were not used as a regular means of payment. They were not struck with an engraved die; rather, the design was punched directly on the flan with punches or other tools. However, a soft material was placed under the thin flan of precious metal – exactly as was done when striking bracteate coins.

coins must have been struck with traditional coin technology in two rounds.[24] If both dies had been used in one round (as is normal for biface coins), many of these thin coins would have developed flan holes or cracked. On many German half-bracteates, the motif of one side clearly dominates the other side. This result can only occur if they are struck with two blows (the design of the second blow will dominate the first). However, it does not exclude that some half-bracteates were struck in one blow, since there exist also half-bracteates where both sides superimpose each other.

It has long been assumed that bracteates were direct successors of half-bracteates and that at some point, a mint master with knowledge of goldsmithing technology or assisted by a goldsmith simply decided to use only one die and a soft material to improve the design and make coinage more efficient. However, the German literature has not been able to explain why these badly struck half-bracteates existed.

An alternative explanation for why the first bracteates in Thuringia were minted has been presented by Kühn.[25] He argues that the first bracteates were minted by goldsmiths, since there was a lack of minting personnel in the growing local markets in Thuringia.[26] This problem may have been solved by several monasteries in Thuringia (for example, Pegau and Nordhausen) that stored relatively large deposits of silver and had goldsmiths available. These goldsmiths had never minted coins, but had a long tradition of engraving thin panels of precious metal using a soft material such as leather or lead under the panels.[27] Hoard evidence shows that the first bracteates in Thuringia were minted between ca. 1120 and 1130.[28] Furthermore, technical analysis shows that these early bracteates were likely struck by individuals with limited prior apprenticeship in coining. The earliest bracteates were experimental in nature. For example, the legend is retrograde, the main design has a relief that is higher than the surrounding circle of pearls, or they were struck with a positive die from the reverse.[29]

Irrespective of which explanation is true, the bracteates were minted with a technology similar to that used by goldsmiths. As in western Germany, in central and eastern Germany, there was a geographic currency constraint for bracteates. Thus,

[24] Haupt 1974, pp. 19ff and Besser, Brämer, Bürger 2001, p. 52

[25] Kühn 1996, pp. 15ff. I have removed some inaccuracies existing in Kühn's publication, so his explanation has been slightly modified here.

[26] If the local markets were to work efficiently, coins were needed that could function as both a medium of exchange and a standard of value. However, the new towns struggled to find well-apprenticed mint personnel. In the beginning of the 12th century, there were only a few mints in Thuringia, and these were unable to satisfy the demand for coins in the region (Kühn 1996, p. 17).

[27] This manufacturing technique is similar to that used to decorate panels on reliquaries (Kühn 1996, p. 18).

[28] Kühn 1996, pp. 20ff. The first European bracteate was probably struck in Pegau ca. 1120–25 by Count Wiprecht von Groitzsch (also Sheriff of Pegau).

[29] Kühn 1996, pp. 26ff.

bracteates were from the beginning valid only in a limited, local circulation area. Notably, however, there is absolutely nothing in the historical record to indicate that the first bracteates were linked to periodic recoinage. On the contrary, based on the evidence of many die variants of specific issues, such coins seem to have circulated for relatively long periods.[30] Furthermore, coin hoards show that the earliest bracteates circulated for long periods[31] and that only a few bracteate types were issued during two decades (1120–1140).[32] However, the inherent fragility of bracteates was an endemic problem that forced the issuer to substitute new for damaged bracteates from the same issue.[33]

A breakthrough for bracteates occurred in the 1140s and 1150s, when hundreds of minting authorities in central, eastern and northern Germany realized that bracteates were well suited for periodic recoinage (see section 1). Many of the mints that started coining bracteates had never minted before. It was far easier to persuade people who had almost never seen coins before to use fragile bracteates (e.g., those in Thuringia and Saxony) than people in areas with stable biface coins (e.g., Rhineland and Westphalia). However, among the established mints, it was those that had earlier minted half-bracteates that continued to mint bracteates.[34]

4. Overstriking of bracteates and biface coins

Besides the engraving and production of the coin die, the production of the silver flans was the most expensive step in the minting procedure, since it involved several steps (see section 3.2). By overstriking old coins, the costly and time-consuming production of flans could be saved. In such case, old coins did not need to be melted down. The overstriking involves two steps. First, the old coin is hammered out and a new flan is created. Second, a new coin is struck on the new flan.

The left panel of Fig. 4 illustrates what happens when coins are overstruck multiple times with traditional minting technology. As shown in the left panel of Fig. 2, the finished coin is thinner and has a larger diameter than the original flan. However, when undergoing the first hammering out in Fig. 4, the flan also becomes thinner and expands in diameter. For each step – irrespective of whether it is flat

[30] Röblitz 1985, pp. 14ff.

[31] Röblitz 1985, p. 16.

[32] Kühn 1996, pp. 20ff.

[33] Dobras 2005, p. 9.

[34] Examples of such mints are Halberstadt and Quedlinburg (Harz), Erfurt (Thuringia) and Hildesheim (southern Lower Saxony). Other mints in western Germany that had struck half-bracteates never began minting bracteates (Worms, Weinheim, and Speyer). The transition of a mint from minting biface coins, via half-bracteates, to bracteates could have taken decades. Sometimes, bracteates, half-bracteates and biface denarii were struck simultaneously.

hammering or striking a new coin – the flan becomes thinner and expands in diameter. In the end, the flan becomes so thin that it is hardly possible to produce a coin with an upper and a lower die without cracking the coin. This characteristic is exactly that of the biface half-bracteates. Thus, using a traditional coin technology, old coins can only be overstruck a few times. The appearance of two-sided half-bracteates in the second half of the 11th century is likely the result of a desire to reduce production costs by overstriking old coins. However, this attempt to save costs partly failed.

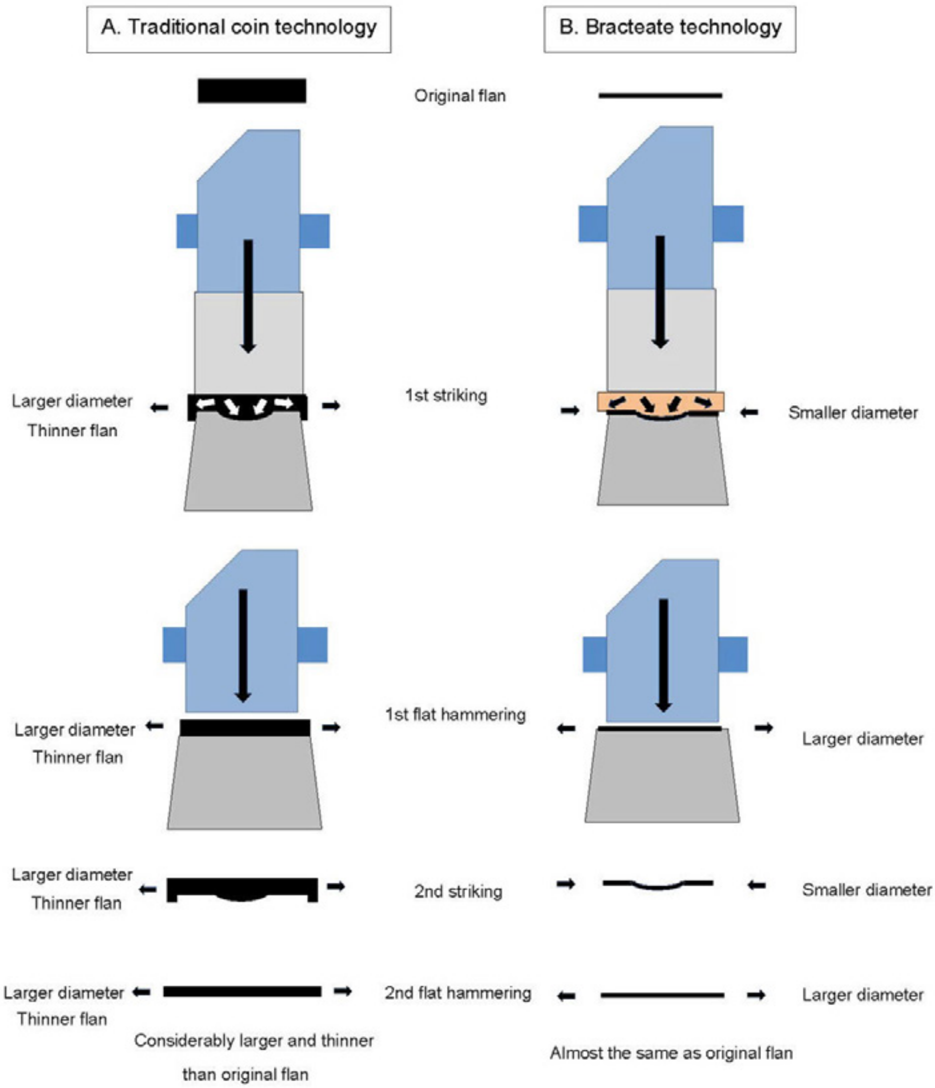

Fig. 4. Overstriking with traditional and bracteate technologies

In the right panel of Fig. 4, the effects of multiple overstriking of bracteates are depicted. As was shown in Fig. 2, the thickness of the flan is not affected when a bracteate is struck, since the flan bends and the diameter contracts. When the bracteate is hammered out, almost the same impacts apply as in the left panel; the diameter expands. Thus, the new flan has almost the same size as the original one. However, because the bracteate is so thin, a less powerful strike is needed to hammer out the old bracteate. Thus, the thickness of the flan is hardly affected.

Fig. 5. Overstruck bracteate; *Meissen/Freiberg* (Schwinkowski 480); Ø 42 mm, scale 1.5:1

Fig. 6. Overstruck bracteate; *Fulda* (Berger 2301); Ø 25 mm, scale 1.5:1

The procedure of striking and hammering out means that a bracteate can be overstruck multiple times. Metallurgy and the bending characteristic of bracteate technology explain why it is more efficient to overstrike bracteates than traditional biface coins. Since bracteates were not linked to periodic recoinage until the 1140s (see section 3.3), it is likely that the first bracteates were produced as a result of

Fig. 7. Overstruck bracteate; *Magdeburg* (Mehl 630); Ø 20 mm, scale 1.5:1

the failure of overstriking biface (half-bracteate) coins with the traditional minting technology. When goldsmith technology was used instead of a traditional coin technology, the flan remained nearly unchanged after multiple overstrikes.

As previously mentioned in relation to the Grünroda hoard, most empirical evidence for the overstriking of bracteates can be seen as traces of an old type in the background of the design. One often needs a magnifier to identify such traces. If the flat hammering of the old type, before re-striking, is well done, there will be no traces at all. However, there are also examples on overstruck bracteates where traces are distinct for the eye (see Figures 5–7). In these cases, the flat hammering has been incomplete.

5. Concluding remarks

The previous literature has been aware that bracteates were more frequently overstruck than biface coins. The evidence for this practice includes flat hammered bracteates in coin hoards and traces of overstrikes on bracteates. However, nobody has explained why bracteates were easier to overstrike than biface coins produced through traditional minting technology. In this study, I have explained why the characteristics of bracteates – originating from goldsmith technology – make them easier to overstrike multiple times.

When coins produced through traditional technology are overstruck, the flan will be larger and thinner both when striking the coin and when hammering out the old coin to a new flan. After multiple overstrikes, the flan will expand in diameter and become so thin that it will crack. The final result will be a half-bracteate, where the obverse and reverse designs are superimposed. The previous literature has not explained why half-bracteates existed. In contrast, the bracteate technology implies that the design of the bracteate is created by bending the thin flan. The diameter becomes smaller than that of the original flan, and the thickness is not affected. When the old bracteate is hammered out, the flan expands again – becoming almost the same size as the original flan. This characteristic means that bracteates can be overstruck multiple times without altering the size of the flan.

The golden era of the bracteates – ca. 1140–1300 – is closely linked to periodic recoinage. The relatively large diameter of bracteates made it possible to display various images on the coins, allowing valid and invalid coins to be quickly and reliably distinguished. Furthermore, only one die was needed, and this die lasted longer than traditional dies. These factors explain why bracteates became so successful but cannot explain why the first bracteates in the 1120s were produced, since these early ones were not linked to *renovatio monetae*. The analysis in this study instead suggests that at the end of the 11th century in Germany, there was a desire to make minting production more efficient. Hammering out and overstriking old coins eliminated one of the costliest steps in the minting production – producing flans. However, this attempt partly failed, as the result was half-bracteates. Switching to a goldsmith technology and producing bracteates allowed for multiple overstrikes. This approach was particularly practical later, when coins were often reminted on a timely basis under periodic recoinage. The analysis of overstrikes in this study explains not only why the first bracteates in the 1120s were produced but also why half-bracteates were produced in the 11th and 12th centuries.

Bibliography

Besser R., Brämer H., Bürger V.
2001 *Halberstadt Münzen und Medaillen. In Spiegel der Geschichte,* part I, *Münzen*, Halberstadt.

Buchenau H., Pick B.
1928 *Der Brakteatenfund von Gotha*, Munich.

Dobras W.
2005 *Münzen der Mainzer Erzbischöfe aus der Zeit der Staufer, Katalog der Brakteaten im Münzkabinett des Stadtarchivs Mainz*, Beiträge zur Geschichte der Stadt Mainz 34, Mainz.

Gaettens R.
1957 *Das Geld- und Münzwesen der Abtei Fulda im Hochmittelalter, unter Auswertung der Münzen als Quellen*, Fulda.

Golabiewski Lannby M.
2016 *Silverspillet från Örebro medeltida myntverkstad*, Svensk Numismatisk Tidskrift 7, pp. 168–169.

Gullbekk S.H.
1996 *Brakteatproduksjon i Norge på 1200-tallet*, Svensk Numismatisk Tidskrift 8, pp. 186–187.

Haupt W.
1961 *Der Brakteatenfund von Cröbern, Kreis Leipzig*, [in:] *Arbeits- und Forschungsberichte zur Sächsischen Bodendenkmalpflege*, vol. 9, ed. W. Coblenz, Dresden, pp. 207–259.
1974 *Sächsische Münzkunde*, Berlin.

Höfken R.
1886 *Archiv für Brakteatenkunde*, part I, *1886–1889*, Vienna.

Jäggy Ch., Schmutz D.
1998 *Erkenntnisse zur Herstellung von Brakteaten um 1300: Experimenteller Nachvollzug prägetechnischer Merkmale*, Schweizer Münzblätter 48 (189), pp. 14–21.

Kluge B.
2007 *Numismatik des Mittelalters: Handbuch und Thesaurus Nummorum Medii Aevi*, Berlin and Vienna.

Kühn W.
1996 *Die Anfänge der Brakteatenprägung in Thüringen und ihre Entwicklung bis etwa 1150*, Gesellschaft für Thüringer Münz- und Medaillenkunde 7, pp. 15–54.
2000 *Zur mittelalterliche Prägungstechnik*, Freiberger Münzblätter 9, pp. 1–16.

Malmer B.
2010 *Den svenska mynthistorien. Vikingatiden 995–1030*, Stockholm.

Meding H.
2006 *Die Herstellung von Münzen. Von der Handarbeit im Mittelalter zu den modernen Fertigungsverfahren*, Frankfurt am Main.

Mehl M.
2006 *Die Münzen des Stiftes Quedlinburg*, Hamburg.

Olearius M.J.Ch.
1694 *Isagoge ad numophylacium bracteatorum: quâ, præstantia, usus & natura illorum succincte describitur, additâ centum & amplius eorundem litteris signatorum sylloge Ienae*, Bielcke, Jena.

Röblitz G.
1985 *Zum Umbruch des Geld- und Münzwesens in Thüringen während des 12. Jahrhunderts*, Jahrbuch des Arbeitskreises Thüringer Münz- und Geldgeschichte, pp. 5–18.
1986 *Abriß der Münzgeschichte Arnstadts*, Beiträge zur Heimatsgeschichte 6, Arnstadt.

Schwinkowski W.
1909 *Der Brakteatenfund von Grünroda*, Jahrbuch des Numismatischen Vereins zu Dresden, pp. 32–46.

Svensson R.
2013 *Renovatio Monetae: Bracteates and Coinage Policies in Medieval Europe*, London.
2016 *Periodic Recoinage as a Monetary Tax: Conditions for the Rise and Fall of the Bracteate Economy*, The Economic History Review 69 (4), pp. 1108–1131, https://doi.org/10.1111/ehr.12283.

TECHNIKA MENNICZA OBNIŻAJĄCA KOSZTY PRODUKCJI: POWTARZANE PRZEBIJANIE BRAKTEATÓW

(Streszczenie)

Jednym z najbardziej kosztownych etapów produkcji menniczej była czasochłonna produkcja krążków. Tę drogą fazę można było pominąć dzięki przebijaniu starych monet. W dotychczasowej literaturze dostrzeżono, że w średniowieczu brakteaty były przebijane częściej od monet dwustronnych. Praktyki tej dowodzą rozklepane brakteaty w skarbach i ślady przebić rejestrowane na tych monetach. W niniejszym artykule ukazano dlaczego specyfika techniki brakteatowej czyniła ich wielokrotne przebijanie prostszym niż w przypadku monet dwustronnych.

Do produkcji brakteatów wymagana była specjalna technika mennicza nawiązująca do złotnictwa. Krążek umieszczano na miękkim materiale, a relief uzyskiwano bardziej przez jego odciśnięcie niż wbicie. Tłoczenie brakteatów na rozklepanej starej monecie powodowało, że średnica krążka niemal nie zmieniała się mimo kolejnych przebić. Natomiast przebijanie monet dwustronnych z wykorzystaniem tradycyjnej techniki menniczej mogło zostać wykonane tylko kilka razy, ponieważ skutkowało tym, że krążek stawał się stopniowo cieńszy i większy, przez co mógł pęknąć podczas wybijania. Efektem końcowym będą półbrakteaty, na których przedstawienia z awersu i rewersu przenikają na stronę przeciwną.

Złota era brakteatów – ok. 1140–1300 – ściśle wiąże się z renowacją monety. Stosunkowo duża średnica brakteatów umożliwiała nanoszenie różnorodnych przedstawień na monety, pozwalając na szybkie i pewne rozpoznanie monet ważnych i unieważnionych. Ponadto, do ich produkcji niezbędny był tylko jeden stempel, który też miał dłuższą żywotność od tradycyjnych tłoków menniczych. Czynniki te tłumaczą dlaczego brakteaty stały się tak popularne, ale nie mogą objaśniać dlaczego pierwsze brakteaty wybito w latach 20. XII w., skoro nie miały one jeszcze związku z *renovatio monetae*. W analizie zawartej w tym opracowaniu zasugerowano natomiast, że pod koniec XI w. w Niemczech, zaistniała potrzeba zwiększenia wydajności produkcji menniczej. Rozklepywanie i przebijanie starych monet eliminowało jeden z jej najdroższych etapów – wytwarzanie krążków. Próba ta jednak częściowo zakończyła się niepowodzeniem, ponieważ efektem były półbrakteaty. Przejście do techniki złotniczej i produkcja brakteatów umożliwiła wielokrotne przebijanie. Takie podejście praktyczne było szczególnie później, gdy monety często przebijano w czasach cyklicznej wymiany. Analiza przebić w niniejszym tekście objaśnia nie tylko dlaczego pierwsze brakteaty zostały wyprodukowane w latach 20. XII w., ale też dlaczego półbrakteaty wybijano w wiekach XI i XII.

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