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WAYS OF ACQUISITION OF FIREARMS AND RELATED EQUIPMENT IN THE STATE OF THE TEUTONIC ORDER IN PRUSSIA

Abstract:

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The paper deals with patterns of acquisition of firearms in Teutonic Prussia. Due to the nature of available sources, the main stress is put on acquisitions by the Teutonic Order and by Prussian towns. Centres of manufacture of firearms and related equipment are pointed out. The role of relevant officials of the Teutonic Order and external specialists is discussed. Furthermore, internal organisation of acquisition is dealt with.

Key words: Teutonic Order, Prussia, Middle Ages, the 14th-16th c., military, firearms, artillery, gunpowder, projectiles

Introduction

Research on firearms in the state of the Teutonic Order in Prussia has already had a long tradition. One of the first works dealing with this issue was a paper by B. Engel, devoted to mentions of weaponry in the account book of the Order's Treasurer from the turn of the 14th and 15th c. (Engel 1897-1899). This author also paid some attention to firearms in Prussia in his later paper (Engel 1906-1908). In 1922 an extensive paper by B. Rathgen appeared (1922), which was perhaps the first attempt at dealing with the problem in a comprehensive manner. A new stage of research started in the post-World War II period. In two papers from the 1960s M. Grodzicka discussed the famous find of a light field cannon from the castle of Kurzętnik (Kauernik)¹ in the Land of Chełmno (Grodzicka 1960; 1963). At this occasion, it must be said that this enormously interesting find has been dealt with many times in later works (e.g. Woźniak 1990; Szymczak 2004, 104-105; Chodyński 2007; 2010a; Strzyż 2011, 34-36, cat. No. 5, Pl. IX-X; Stepiński, Żabiński, Strzyż 2013, not to mention some more general publications on Late Medieval arms and armour in Teutonic Prussia and in what is now Poland). Of enormous significance is a book by

V. Schmidtchen (1977), which was another attempt at a comprehensive discussion of firearms in Teutonic Prussia. Of extreme value is also a series of studies on Teutonic arms and armour by A. Nowakowski, where considerable attention was paid to firearms (Nowakowski 1994a; 1994b). Financial aspects of manufacture and use of firearms in Teutonic Prussia in the early 15th c. were dealt with by W. Świątosławski (Świątosławski 1993). Numerous valuable remarks on firearms in the Teutonic Order's state in Prussia can also be found in works discussing issues of arms and armour in what is now Poland (e.g. Głosek 1990; Mielczarek 1998; Szymczak 2004). Eventually, recent years have also brought a significant progress in archaeological research on various aspects of Teutonic firearms (e.g. Wasilewski 2004; Dąbrowska 2007; 2009; Strzyż 2007; 2009; 2011).

The present paper focuses on the issue of ways of acquisition of firearms in the state of the Teutonic Order in Prussia. The two principal actors which generated demand for firearms and related war materials were most obviously the Teutonic Order itself and Prussian towns. As this problem seems to have received somehow less attention than other firearms-related questions, less stress will

¹ With regard to local names, it was decided to use original historical ones first, while later names are given in parentheses, therefore: Gdańsk (Danzig), but Marienburg (Malbork).

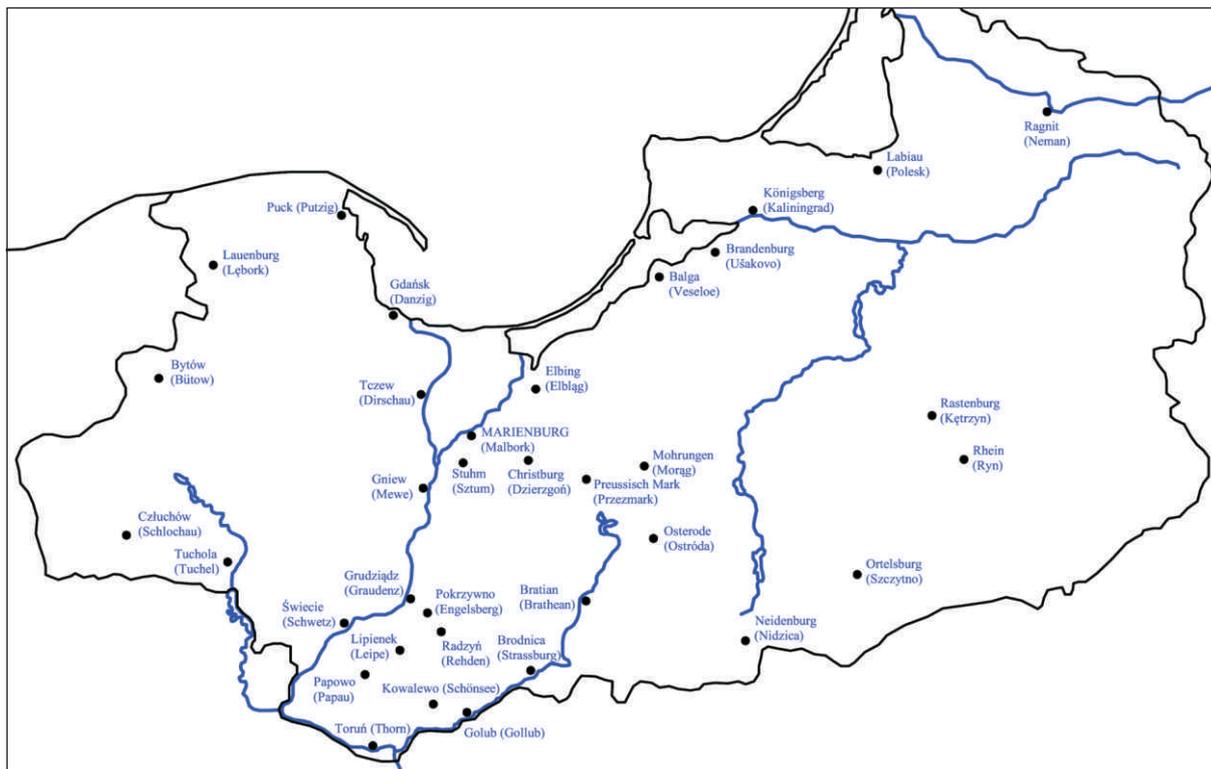


Fig. 1. The state of the Teutonic Order in Prussia at the beginning of the 15th c. *Drawing by G. Żabiński.*

Ryc. 1. Państwo krzyżackie w Prusach na początku XV w. *Oprac. G. Żabiński.*

be put on such issues as prices of raw materials, expenses on firearms, technology of manufacture and so on. Apart from firearms as such, issues of acquisition of gunpowder, projectiles and utensils, as well as questions concerning personnel involved in manufacture and use of this kind of weaponry will also be dealt with. The most important research questions are the following:

1. own manufacture/local provenance and external sources – from abroad and from other centres within the state of the Order (e.g. commissions of war materials related to firearms by a town in another town);

2. centralised or decentralised way of acquisition of projectiles, gunpowder and firearms: most naturally, this first of all concerns the manufacture by the Order and for the needs of the Order;

3. internal organisation of acquisition (first of all, acquisition via own manufacture): what officials/members of the Order or specialists in Prussian towns were involved, what duties and tasks they fulfilled, how were manufacturing processes organised, and so on. This issue also includes the presence of external specialists: their provenance (the Order's state or abroad), and tasks they performed (acquisition of raw materials, supervision of manufacturing processes, use of firearms);

4. organisation of transport: apart from mentions of transport related to battlefield use, there are also numerous records concerning transport of raw materials, transport of ready items (firearms, projectiles, gunpowder) to places of their deployment, transport of firearms for repair, and the like.

Concerning the chronological scope of the paper, the main stress will be put on the period between the late 14th c. and about 1420. This is obviously due to the fact that the source basis for this period is the most comprehensive. However, it was also attempted at making use of later sources, although their value is naturally less significant.

With regard to the source basis, one should first mention sources concerning the Teutonic Order as such. Of utmost importance are the Order's account books. Apart from the account book of the Order's Treasurer (MTB) which encompasses the period of 1399-1409, valuable remarks on firearms-related matters can also be found in the book of the Marienburg (Malbork) Convent (MKB, 1399-1412), and in the expense book of the House Commander of Marienburg (AMH, 1410-1420). Inventory sources (inventories and visitations, see *Visitationen* 2002; 2004, GÄDO and MÄB; on the nature and value of the latter two see recently Żabiński 2011; 2013; see also Stepiński, Żabiński,

Strzyż 2013, 164-165) are of less significance, although they sometimes also offer valuable data on acquisition of firearms, projectiles and gunpowder. Of some importance are also trade accounts of the Order, as they sometimes mention acquisition of raw materials related to firearms (see *Handelsrechnungen* 1887). Apart from the Order, firearms and related war materials were also acquired by Prussian towns (Fig. 1). Regrettably, the only municipal account books from Prussia which have been published so far are those of the Old Town of Elbing (Elbląg) (NKRSME 1987; 1989 – 1404-1414) and of Toruń (Thorn) (KKMT, 1453-1495). It is especially the first one which offers numerous interesting records on municipal firearms. Apart from these books, some relevant mentions on municipal firearms can also be found in account books produced for the needs of the Prussian Confederacy during the Thirteen Years War (1454-1466) against the Order (see KZZP, KT and KDMT). Numerous relevant pieces of information can also be retrieved from acts of Prussian estates (*Acten der Ständetage*) and from narrative sources (such as, e.g. *Ältere Hochmeisterchronik*, the *Prussian Chronicle of Simon Grunau*, the continuation of the Chronicle of Johann von Posilge, and others). Obviously, the latter must be treated with special care. Eventually, valuable data can also be found in extracts of sources from the Ordensbriefarchiv (see *Regesta*).

Eventually, one must also say some words on the monetary and weight system which was used in Prussia at that time. The data offered below is based on sources and scholarship used in this paper.

Currency:

1 Mark – 4 Ferto (Vierdung) – 24 Scots – 60 Schilling (shillings) – 720 Denars

Weights:

1 Last – 12 Tonnen (barrels) – 12 Schiffspfund (skippounds) – 36 Zentener – 240 Lispfund (lispounds) – 4320 Pfund (pounds)

1 Stein (stone) – 34 Pfund in Gdańsk (Danzig) and Elbing, 24 Pfund in Toruń

1 pound – c. 0.405 kg

The role of external sources in the acquisition of firearms and related equipment

It must be said that the significance of external sources in the acquisition of firearms and related equipment was very uneven. Concerning raw materials (be it for firearms, projectiles or gunpowder), it is obvious that these which were not available locally must have been imported from abroad. It must of course be borne in mind that records of purchases of metals are quite frequent in Teutonic sources, but it was not a rule to state

either the provenance of raw materials or their future use. The problem of imports first of all concerns metals used for gun manufacture, with special reference to copper and tin.

Records in the Treasurer's account book frequently mention acquisitions of such metals for gun casting. Sometimes metals were bought in Gdańsk and then transported to Marienburg, as it was the case with copper and tin in 1401 (MTB 99, 119-120; Rathgen 1922, 22; 1928, 403; Schmidtchen 1977, 54; Stepiński, Żabiński, Strzyż 2013, 173). On the other hand, in 1403 a purchase of copper from Banská Bystrica (Neusohl) in Upper Hungary (now Slovakia) was mentioned. It was bought in Toruń by the Order's Grand Dispenser. At this occasion, tin was also bought, but its provenance was not stated (MTB 217; Schmidtchen 1977, 55). Upper Hungarian copper was also used in 1408 for the casting of the famous *Grose Bochse*. This time, it was bought in Gdańsk and then transported to the Order's capital. Again, tin was also bought, with no mention where it came from (MTB 480; Posilge 1866, 292; on this cannon see also Engel 1897-1899, 230; Rathgen 1922, 25; 1928, 405; Schmidtchen 1977, 56-59; Świątosławski 1993, 28; Nowakowski 1994b, 334; Szymczak 2004, 108; Chodyński 2010b, 190; Strzyż 2011, 38; Żabiński 2012, 31-40; Stepiński, Żabiński, Strzyż 2013, 166-167, 173-174; on analogous superguns see, e.g. Williams, Paterson 1986, 185-205; Smith, Brown 1989, 1-50; Mielczarek 1998, 68; Szymczak 2004, 62-64, 76, Tab. 2; Smith, DeVries 2005, 204-211, 262-267; Strzyż 2011, 79-81). In 1408 another large purchase of copper and tin for the *Grose Bochse* in Gdańsk and then its transport to Marienburg were recorded; however, nothing was said on the provenance of the raw material (MTB 501; Rathgen 1922, 26; 1928, 405). Another purchase of copper in Gdańsk was related to a repeated casting of this cannon's chase. For this purpose, lead was also bought (MTB 506; Rathgen 1922, 27; 1928, 405; Schmidtchen 1977, 58-59). In this year, tin for gun casting was also bought locally in Marienburg (Malbork), both for the *Grose Bochse* and other unspecified guns (MTB 480, 511; Schmidtchen 1977, 58). In 1409, there was another series of purchases of copper and tin in Gdańsk for casting of another large cannon (*Bochse nest der grosen*). These raw materials were transported to the Order's capital, but their initial provenance was not specified (MTB 557-558; Rathgen 1922, 28-29; 1928, 406; Schmidtchen 1977, 59-60; Żabiński 2012, 32; Stepiński, Żabiński, Strzyż 2013, 174). For this cannon, some tin was also bought in Marienburg (MTB 558; Rathgen 1922, 29; 1928, 406; Schmidtchen 1977, 59-60).

Interestingly, it was in all probability this cannon, later known as *Die Faule Grete*, that was leased in 1413 to Markgrave Friedrich I von Brandenburg, who successfully used it to suppress internal opposition (Rathgen 1924, 45-76; 1928, 459-476). Also in 1409 raw materials were obtained by the Order for casting of a gun called the *Lange Bochse* and another cannon. Interestingly, although copper was bought by the Grand Dispenser in Gdańsk and then transported to Marienburg, tin was purchased locally from pot-founders (*kannengisser*) (MTB 590-591; Schmidtchen 1977, 60).

An interesting source of acquisition of metal (although obviously a local one) were destroyed guns. Apart from mentions of damaged or destroyed guns which were sent to manufacturing centres to be repaired (this is discussed below), there are also records of stores of metal from such guns. The inventory of the Commandery of Tuchola (Tuchel) in 1422 mentioned 10.5 stones of copper from two guns which broke in that year (*die heuwer sind czubrachen*) (GÄDO 642; Rathgen 1922, 11; 1928, 397).

Foreign non-ferrous metals for gun manufacture were also acquired by municipal authorities. In 1410, the Old Town of Elbing bought copper from Iurgen from Lübeck and Konek from Westphalia (NKRSME 1987, 229; Rathgen 1922, 69; 1928, 428).

On the other hand, there are also occasional remarks on the import of iron. In 1411, the account book of the Marienburg Convent recorded a purchase of three barrels of osmund iron for 4.5 Marks. The iron was bought by Peter Korner from Johann of Toruń in Elbing upon the order of the Grand Master. 4 Scot was paid for the transport by water from Elbing and the iron was to be used by a master Johann to forge guns (*do von meyster Johan bochsen smeden sal*) (MKB 252). Interestingly, in 1412 the account book mentioned a purchase of 2 Schiffpfund of iron by the smithing master for 3 Marks. The iron was supposed to be used for casting of large projectiles for terrace guns (*in dy grosen gelote czu gissen czu den tarrasbochsen*) [MKB 282; iron bullets (*yserynne gelote*) were recorded at the castle of Bratian (Brathean) in 1411, GÄDO 366; on cast iron projectiles see also Szymczak 2004, 152-154; Smith, DeVries 2005, 47-48, 254; Klimek, Stępiński, Strzyż, Żabiński 2013, 93; Stępiński, Żabiński, Strzyż 2013, 179]. Osmond also appeared in a military context in 1451, when three barrels of it were recorded among weaponry resources (*an harnisch*) during a visitation of the castle of Oberpahlen (Pöltsamaa) in Livonia (now Estonia). Regrettably, nothing more was said on its intended use (*Visitationen* 2004, No. 147, 35). Furthermore, acquisitions of Swedish iron in Gdańsk for the needs of manufacture of projectiles were

also mentioned with regard to war preparations of Grand Master Albrecht von Hohenzollern before 1519 (Grunau 1876, 322-323).

With regard to external purchases of firearms, this way was sometimes used by Prussian towns, which bought their guns in larger centres. In 1410, some guns (*bussen*) were bought by the Old Town of Elbing in Gdańsk, which implies that these were bought from the authorities of the latter. There were, however, some difficulties with their delivery (NKRSME 1987, 217, 221; see also EK 242; Rathgen 1922, 69; 1928, 428; Świętosławski 1993, 21; Chodyński 1996a, 17; Stępiński, Żabiński, Strzyż 2013, 183). An interesting mention from this year concerns a gift of a gun to the town by the King of Poland (EK 247; Rathgen 1922, 67; 1928, 427). In 1414, the town paid 78 Marks to Gdańsk for a gun (*buchse*) which weighed 12.5 Zentener (NKRSME 1989, 78, 90; Rathgen 1922, 70; 1928, 428; Świętosławski 1993, 21; Chodyński 1996a, 18; Szymczak 2004, 109; Stępiński, Żabiński, Strzyż 2013, 183). Firearms could also be purchased in other centres from private persons. In 1461, the town of Toruń bought six iron veuglaires (*eysern camerbuchssen*), four hackbuts (*okenbuchssen*) and two silvered pavises from a woman named Pfeilschestynne from Elbing (KKMT, No. 15). Concerning the Order itself, mentions of purchase of firearms are very late (W. Świętosławski proposed with right that at the turn of the 14th and 15th c. the Order manufactured most of its firearms on its own – Świętosławski 1993, 20). Grunau reported that in the course of his war preparations (i.e. before 1519) Grand Master Albrecht von Hohenzollern bought hackbuts (*hackenbuchsen*) in Nürnberg for 4000 Marks (Grunau 1889, 483). Furthermore, in 1520 there are mentions of supplies of guns and ammunition to the Grand Master from Copenhagen (*Regesta* 1973, 1.3, 251, No. 23766). In 1524, the inventory of the Commandery of Rhein (Ryn) recorded nine Bohemian hackbuts (*bohemysch hocken*), which suggests that these firearms may have been imported (GÄDO 204; Nowakowski 1994a, 103). Anyway, mentions of external purchases of firearms are rather sparse in comparison with those concerning local manufacture. It seems obvious that (especially in the case of larger guns) it was much easier to employ external specialists and let them manufacture firearms locally. This issue is dealt with in detail below.

Furthermore, there is also data concerning imports of raw materials for the needs of gunpowder manufacture. It must be, however, said that records of purchase of such materials hardly mention their provenance. For example, in 1408 the Treasurer covered the expense of the House Commander of

Marienburg of 69 Marks and 18 Denars, paid for 35 stones of saltpetre. The price also included the transport from Wrocław (Breslau) to Toruń (MTB 482). In the same year, another two huge transports (81 and 280 stones respectively) of saltpetre arrived from Wrocław directly to Marienburg. In the case of the latter, a Toruń burgher Gotschalk Hitfelt was mentioned as a person who actually made the purchase in Wrocław and was then reimbursed for it by the Treasurer (MTB 497, 514). In 1409, nearly 9 stones of saltpetre were bought by the Treasurer from a merchant from Nürnberg (MTB 583). Data on imports of raw materials can also be found in the Order's trade accounts. In 1410, Allexander Wynkelman, the Order's official (*Leger*) in Flanders informed that he had sent saltpetre to the Grand Dispenser in Marienburg (*Handelsrechnungen* 52). Furthermore, there are also mentions of import of raw materials for gunpowder manufacture from the times of the last Grand Master Albrecht von Hohenzollern. In a letter from 13 April 1514, sent from Königsberg (Kaliningrad) to Joachim I Nestor, Prince Elector of Margraviate of Brandenburg, the Grand Master requested deliveries of saltpetre (*Regesta* 1973, 1.3, 53, No. 20082). Such deliveries are in fact mentioned in a letter from 20 August 1517, sent from Berlin by an Anton Wyna to the Grand Master (*Regesta* 1973, 1.3, 129, No. 21489).

It also occurred that ready gunpowder was purchased by the Order's authorities. In this case, the matter is rendered difficult by the fact that sometimes only a payment was recorded, but it was not stated whether it concerned manufacture at a Teutonic castle, or a purchase of ready gunpowder. E.g., in 1404 the Grand Marshall was reimbursed by the Treasurer for 2 barrels of gunpowder (MTB 287). In some other cases, records are more informative. In 1409, the Treasurer paid for 5 pounds of gunpowder, which were bought from the parish priest in Schadewalde (Szawałd) near the Order's capital (MTB 525).

The same can be said for Prussian towns. In 1410, a considerable sum of almost 67.5 Marks was paid to a certain Jacob Kallen by the authorities of the Old Town of Elbing for gunpowder (NKRSME 1987, 233; EK 242; Rathgen 1922, 70; 1928, 428; Świętosławski 1993, 26; Chodyński 1996a, 17).

Centres of manufacture

Manufacture of firearms

With regard to manufacture of guns, it was obviously the Order's capital that played the most important role (see e.g. Schmidtchen 1977, 53-54, 56-60, 62, 64; Świętosławski 1993, 20; Nowakowski 1994b, 334-335; Stępiński, Żabiński, Strzyż 2013, 181-183). In 1401, purchases of tin

and copper for gun casting as well as a payment of 24 Marks to a smith Molner for making 12 iron guns (*yserynne buchsen*) were recorded in the Treasurer's account book (MTB 119-120; Engel 1897-1899, 230; Rathgen 1922, 23; 1928, 403; Schmidtchen 1977, 54, 62; Świętosławski 1993, 22; Nowakowski 1994b, 334; Szymczak 2004, 80, 185; Stępiński, Żabiński, Strzyż 2013, 170, 172; on wrought iron guns see also Smith 2000, 68-80; Szymczak 2004, 79-83; Smith, DeVries 2005, 238-239). Manufacture of iron guns at Marienburg was mentioned in 1404 (MTB 309) and 1408 (MTB 502). In 1402, there is another mention of gun casting (MTB 140; Rathgen 1922, 23; 1928, 404), as well as a record of a repeated casting of 2 guns, which were then sent to Ragnit (Neman) (MTB 201; Rathgen 1922, 24; 1928, 404; Schmidtchen 1977, 55, 63; Świętosławski 1993, 21; Stępiński, Żabiński, Strzyż 2013, 173). One could therefore naturally assume that the latter concerns a repair of damaged firearms, which could not be carried out locally. Other mentions of gun casting at the castle of Marienburg come from 1403 (MTB 217) and 1405 (MTB 339; Rathgen 1922, 25; 1928, 404; Schmidtchen 1977, 55-56, 63; Świętosławski 1993, 21-22; Nowakowski 1994a, 102; Szymczak 2004, 107; Stępiński, Żabiński, Strzyż 2013, 173).

The year 1408 in the Order's capital is first of all marked by the casting of the afore-mentioned *Grose Bochse* and the manufacture of all necessary equipment for it (MTB 480, 501-502, 506-507, 511, 515). However, this supergun was not the only piece of firearms which was cast at Marienburg in that year (MTB 483, 496, 510-511; Schmidtchen 1977, 53, 64).

From 1409, apart from numerous works on gun equipment, moulds for gun casting, ornamental shields (heraldic ones?) for gun barrels, gun carriages or stocks, and so on (MTB 525, 545, 547, 553, 555, 559, 562, 571, 573-574, 579, 588, 590), there are mentions on casting of the second largest cannon (*Bochse nest der grosen*) at Marienburg (MTB 557-558). Other guns were also cast (MTB 558, 591). One of these was a long cannon (*lange bochse*) (MTB 590-591) which was in all probability a different gun than another long cannon which was cast in Gdańsk in the same year. Furthermore, works on necessary equipment for the *Grose Bochse* were continued (MTB 558, 574, 579; Rathgen 1922, 29; 1928, 406-407). Interestingly, some minor works on this supergun were also carried already during the use of this cannon in the war with Poland and Lithuania, when it was stationed at the castle of Bobrowniki (Biberern). The expenses were paid for by the House Commander of Toruń, for which he was

reimbursed by the Treasurer (MTB 597; Żabiński 2012, 37-39).

In 1403, there are mentions concerning finishing works on guns and manufacture of gun stands or carriages (*laden*). These were to be sent to Ragnit (MTB 247; Schmidtchen 1977, 70). A similar case can be seen in 1409, where two medium-sized guns (*mittelbochsen*) were manufactured at Marienburg and then sent to other castles of the Order – to Grudziądz (Graudenz) and to Kowalewo Pomorskie (Schönsee) (MTB 558; Rathgen 1922, 29; 1928, 407; Schmidtchen 1977, 60; Świątosławski 1993, 22, Szymczak 2004, 56-57, 107; Stepiński, Żabiński, Strzyż 2013, 173). In the same year, a medium-sized gun was transported from Grudziądz to the Order's capital, at its touch hole got burnt through (MTB 574; Schmidtchen 1977, 64; Stepiński, Żabiński, Strzyż 2013, 181).

New data on the manufacture of firearms at Marienburg is available from the period after the Great War of the Order with Poland and Lithuania. From 1411, there are mentions of making of stocks or carriages for guns which were tested (*laden...czu den buchsen dy man beschos*) (AMH 20), as well as making steel touch holes (*stelen yn czundelocher*), moulds for gun casting and obviously gun casting itself (AMH 24-25, 27-28). In 1412, apart from gun casting, also making of carriages or stocks (*bochsenladen*) and wooden shutters for guns was recorded (AMH 51, 59, 61-62, 68-69, 75, 77-78). More or less the same can be seen in the next year. Interestingly, records from 1413 mention the casting of another large and long cannon (*grosse lange buchse*) (AMH 101, 104-105, 109, 113, 117). The manufacture of guns and related equipment was also recorded in 1414 (AMH 126, 135-137, 143, 148; Chodyński 2010b, 189). From this year there is also a mention of a broken gun which was taken from Bratian (Brathean) to Marienburg, in all probability to be repaired (AMH 145). Works on guns and their equipment in the Order's capital continued in 1415 (AMH 176-177, 187, 193) and 1416 (AMH 221). In 1417, apart from data on manufacture, there is also a mention of construction works at the foundry (AMH 249, 252, 268-269, 271, 273, 278-279; on archaeological evidence of the foundry at the castle see Dąbrowska 2007, 308-311; 2009, 22-28; Józwiak, Trupinda 2007, 412-413; Strzyż 2011, 36-37; Stepiński, Żabiński, Strzyż 2013, 181-183, 234, Pl. XVIII; see also Steinbrecht 1911, plan of the castle at the end of his work). A continuation of works on guns and related equipment can be seen in 1418 (AMH 300-301, 305, 310-311), 1419 (AMH 327-329, 334, 338) and 1420 (AMH 354, 357-359). From 1419, there is another mention of

a possible repair of guns from other Teutonic castles in Marienburg. The inventory of the Commandery of Ragnit mentions two damaged stone cannonball guns (*steynbochsen die synt czubrochen*) which were sent to the Order's capital (GÄDO 276; Stepiński, Żabiński, Strzyż 2013, 181).

The Order's capital was not the only place of manufacture of firearms. From 1409 there is a series of records concerning the casting of a long cannon (*lange bochse*) in Gdańsk (MTB 554, 573, 590-501; Stepiński, Żabiński, Strzyż 2013, 174). Although this cannon was obviously paid for and manufactured for the Order's needs, it is difficult to say whether it was physically made within the Order's possessions in the city, or in the city itself. It is also known that a small long cannon (a veuglaire – *cleyne lange bochse ... mit 3 polfergehusen*) was cast in Gdańsk in that year. Interestingly, after casting it was transported to the Order's capital (MTB 554, 559, 753; Rathgen 1922, 29; 1928, 407; Schmidtchen 1977, 61-62; Świątosławski 1993, 23; Szymczak 2004, 107, 109-110; Strzyż 2011, 33; Stepiński, Żabiński, Strzyż 2013, 183). It could perhaps be assumed that the long cannon and the small long cannon was one and the same gun. This cannon was provided with a wagon (*wayn*), which was perhaps made locally at Marienburg (MTB 573; Rathgen 1922, 30; 1928, 407). In 1414, the inventory of the Commandery of Pokrzywno (Engelsberg) mentioned one stone cannonball gun which was in Toruń and was to be cast again (GÄDO 589). It cannot be therefore excluded that the latter town was another centre of firearms manufacture.

As mentioned above, there are several pieces of information mentioning the manufacture of firearms at the castle of Marienburg, which were then to be deployed at other castles of the Order. This obviously implies a rather centralised system of supplies. It could be, however, assumed that local officials may have also had some initiative in the acquisition of firearms for the needs of the centres they held. For instance, the inventory of the Commandery of Memel (Klaipeda) from 1447 says that the leaving commander purchased one stone cannonball gun with three gunpowder chambers for the castle (*1 steynbochse czum huwze mit 3 kamern*) (GÄDO 313).

Minor works on firearms (small repairs, equipment for gun wagons, stands, etc.) were also done in other possessions of the Order. Such works were carried out in 1409 during the war with Poland and Lithuania at the castle of Bobrowniki (MTB 597; Żabiński 2012, 34-35).

For the period after 1420, data on Teutonic manufacture of guns is sparse, chiefly due to the

lack of account books from this period. In 1507, the inventory of the castle of Preussisch Mark (Przemark) which was part of the Commandery of Christburg (Dzierzgoń) mentioned two new serpentines which were not ready yet (*new schlangen sint noch nicht fertig*; on the early 16th c. terminology of artillery see, e.g., Chodyński 1996b; Szymczak 2004, 57-58, 66-67, Tab. 1; on early serpentines see Smith, DeVries 2005, 227-230). It could therefore be supposed that some finishing work was to be done locally. Furthermore, the same inventory records an iron drill for guns (*eisern buchsenebiger*) (GÄDO 146). Interestingly, another inventory of this castle from 1508 simply records two new serpentines, without any further reference to their condition (GÄDO 147). Casting of guns in Königsberg upon the order of Grand Master Friedrich von Sachsen (1498-1511) is mentioned in the chronicle of Grunau (Grunau 1876, 322; 1889, 383). Furthermore, Grunau says that after the battle at Polotsk in 1518 between Polish-Lithuanian forces and the army of the Grand Duchy of Muscovy (Russia), the Lithuanians found guns with the coat of arms of the Order in the enemy's camp (Grunau 1889, 466). For 1517-1519, there is a mention in the *Danziger Chronik vom Bunde* with regard to war preparations of Grand Master Albrecht von Hohenzollern, supported by Hiob von Dobeneck, Bishop of Pomesania. The chronicle said that in Kwidzyn (Marienwerder) an "iron mill" (*eysen mole*) was constructed. In this workshop projectiles for firearms and firearms themselves (*buxsenlote und buxsen*) were made (*Danziger Chronik vom Bunde* 466). Similar data (although it is difficult to say how credible) is provided by Grunau, who even provides a number of 236 cast small and large guns, not counting handgonnes. Among the artillery, there were two large cannons – the *Scharfe Metze*, which needed 120 pounds of gunpowder, and the *Bose Gritte*, which needed 100 pounds (Grunau 1889, 420; for various kinds of cannons at that time see, e.g., Górski 1902, 33-37; Goetz 1985, 33-34; Chodyński 1996b, 51-59; Szymczak 2004, 67-68, Tab. 1). Furthermore, Grunau says that in Summer 1520 the Grand Master ordered to gather bells from burnt churches and cast guns from them (Grunau 1889, 547). This is confirmed by a letter from a Henrich von Kittlitz to the Grand Master from 11 September 1520. The author of the letter reported that church bells in Schippenbeil (Sępopol) and Leunenbug (Sątoczno) were used to cast guns (*Regesta* 1973, 1.3, 270, No. 24146; on this issue see also Szymczak 2004, 86). Furthermore, a list of artillery equipment in the Order's state, dated to about 1523, mentions a number of guns in

Königsberg, which were to be drilled and made ready again (*von neunhen lassen boren und fertig machen mit aller notthurft*) (Biskup 1984, 100). The same list records five guns which were ordered to be cast again (*Auch hab ich von neunhes lassen gyesse*) (*ibidem*, 100-101).

Apart from the Order, own manufacture of firearms was also developed by Prussian towns. In 1404, the authorities of the Old Town of Elbing acquired a gun stand (*bussenstel*) and a new lead bullet gun (*nuge lotbusse*) (NKRSME 1987, 16; Rathgen 1922, 66-67; 1928, 426-427; Świętosławski 1993, 21; Stepiński, Żabiński, Strzyż 2013, 183), so one may ask whether these were not made locally. Two years after that, there is a mention of manufacturing of eight iron rails for guns (*ysern schenen vor bussen*) (NKRSME 1987, 67), which may refer to iron bars used for gun barrels (Stepiński, Żabiński, Strzyż 2013, 183). In 1410, apart from the afore-mentioned commission of guns in Gdańsk, the authorities of the Old Town also paid for the local manufacture of other firearms (NKRSME 1987, 217-218, 229; EK 242; Rathgen 1922, 67; 1928, 427). From the Old Town of Elbing in that year there are also mentions of works on gun wagons and wheels for them (NKRSME 1987, 219), as well as records of manufacture of gun stands (*bussenstelle*) (NKRSME 1987, 229-230). Casting (or more generally manufacturing) of guns and making of gun stands in this town is also testified to in 1411 (NKRSME 1989, 10, 31; EK 252; Rathgen 1922, 70; 1928, 428; Świętosławski 1993, 21, 24; Nowakowski 1994a, 102; Chodyński 1996a, 17; Szymczak 2004, 109, 115; Stepiński, Żabiński, Strzyż 2013, 183) and in 1414 (NKRSME 1989, 77-78, 84, 95; see also EK 260; Rathgen 1922, 70-71; 1928, 428-429; Świętosławski 1993, 24; Stepiński, Żabiński, Strzyż 2013, 183, 184).

Another town where guns were made was Toruń. From November and December 1453 there are letters of the Order's officials to the Grand Master. According to them, the Confederates intended to cast a mortar there (*Acten der Ständetage* 1884, 96-97, No. 71, 215-216, No. 93). A register of firearms which were sent from this town for the needs of troops fighting against the Teutonic Order mentions in 1454 one large stone cannonball gun (*grose steynbouchze*) which participated in hostilities. It burst there and its remains were transported back to the town (Biskup 1966, 86; 1967, 181; Szymczak 2004, 252). Therefore, it cannot be excluded that they were supposed to be re-used for a new gun. Furthermore, in the same year a light field cannon (*hauffenicze*) marked with the coat of arms of the New Town (*gezeichnet mit derselben stat wopen*) was mentioned (Biskup

1966, 92). Its local manufacture is therefore quite possible. Such a gun (perhaps the same one) was also mentioned in 1460 (KŻZP 103-104). More direct evidence is available from 1460, where two guns which were cast by a municipal master gunner (*statbuchszschutze*) are mentioned (KKMT, No. 33). From the period before the last Polish-Teutonic war (1519-1521) there are mentions of manufacture (forging and casting) of firearms (serpentes and demi-serpentes) in Gdańsk (Stegmann 505; *Ferber-Chronik* 531; see also Szymczak 2004, 187). Interestingly, one of the chronicles says that between early April and late May 1523 a large cannon was cast, for which 145 Zentener of copper was used (*Ferber-Chronik* 534). Data on war preparations of the city of Gdańsk is also provided by Grunau, perhaps again in a more anecdotic than trustworthy form. For 1520, he says that because guns held by this city were worthless, the burghers ordered them to be destroyed and to cast new ones (Grunau 1889, 483, 525).

Manufacture of projectiles

Generally speaking, it seems that the manufacture of projectiles in the Teutonic Order was much more decentralised than it was the case with firearms². In 1401, the Treasurer paid for 16 stones of lead (*steyne blyes*) as part of expenses for the castle of Gotteswerder (Raudondvaris near Kaunas). He also paid for the manufacture of stone cannonballs, but these were in all probability made at the Order's capital. On the other hand, the Treasurer also reimbursed the House Commander of Königsberg for his expenses on Gotteswerder, which also include the manufacture and transport of stone and lead projectiles. It can be therefore assumed that these projectiles were made at Königsberg (MTB 116-117, 127; Rathgen 1922, 23; 1928, 404; Schmidtchen 1977, 69; Stępiński, Żabiński, Strzyż 2013, 174). A year after that, the Treasurer also recorded expenses for stone cannonballs (*buchsensteyne*) at Memel and Königsberg, so it can be assumed that these projectiles were made there (MTB 195). It can be also supposed that a number of stone cannonballs which were to be sent to Ragnit in 1403 were made at Königsberg, as the local House Commander paid for their manufacture and transport (MTB 246-247; Stępiński, Żabiński, Strzyż 2013, 185). The same may have

concerned iron shots (*hagelgeschos*) which were to go to Memel in that year (MTB 248; Świątosławski 1993, 25). In 1409, the Treasurer paid for 2 Zentener of lead, which was bought in Königsberg and was to be used for lead bullets for Ragnit (MTB 559). In this case, the former centre can be supposed as the place of manufacture.

Of course, Marienburg was the most important centre of projectile manufacture in the Order. In 1401, the Treasurer paid for the manufacture of numerous stone projectiles – interestingly, these expenses were recorded under the entry *Buchsenngisser* (MTB 119-120; this entry also contained numerous expenses on firearms; Schmidtchen 1977, 65; Dąbrowska 2009, 40; Stępiński, Żabiński, Strzyż 2013, 174). New expenses for the manufacture of *buchsensteyne* were recorded in 1403 (MTB 212; Rathgen 1922, 24; 1928, 404; Schmidtchen 1977, 65; Świątosławski 1993, 25; Stępiński, Żabiński, Strzyż 2013, 174). New data comes from 1407, when the casting of 3 Zentener of lead bullets was mentioned (MTB 446; Rathgen 1922, 25; 1928, 404; Schmidtchen 1977, 69; Świątosławski 1993, 25; Stępiński, Żabiński, Strzyż 2013, 174). Most obviously, there were new expenses for projectile manufacture at Marienburg in 1408. There are mentions of manufacture of both stone and lead projectiles (MTB 497, 511; Rathgen 1922, 26; 1928, 406; Schmidtchen 1977, 65, 69; Świątosławski 1993, 25; Szymczak 2004, 150). An interesting phenomenon can be seen in 1409. Projectile manufacture is obviously recorded at the Order's capital castle, especially after the outbreak of the war with Poland and Lithuania (MTB 545, 571-572; Rathgen 1922, 30; 1928, 407; Schmidtchen 1977, 65, 69; Świątosławski 1993, 25; Stępiński, Żabiński, Strzyż 2013, 174). Furthermore, in some cases it is explicitly mentioned to what destination the projectiles were supposed to go, e.g., to Balga (Veseloe) (MTB 556, 572; Rathgen 1922, 28-30; 1928, 406-407; Schmidtchen 1977, 68; Stępiński, Żabiński, Strzyż 2013, 174). On the other hand, stone cannonballs within the Commandery of Marienburg were also made in other localities, as the manufacture of such projectiles in the village of Sobowidz (Sobowitz) near the Order's capital was mentioned (MTB 523, 572; Rathgen 1922, 30; 1928, 407). This village is also mentioned with regard to stone cannonballs in 1411 (MKB 252). Projectile manufacture at Marienburg is also mentioned in 1410 and 1411 (AMH 6, 11). As

² On archaeological finds of projectiles from the territory of the Teutonic Order's state in Prussia see e.g.: Arsyński, Sikorska-Ulfik 1990, 70-71; Wasilewski 2004, 148-152; Strzyż 2007, 461-470; 2009, 198-223; 2011, 50-51, 53-55, 58-62, 65, 67, 69-70, 73-75, 85-94, 96-100, 105-109, 112-113, 115-118, cat. Nos. 21-22, 36-38, 45-66, 74-99, 103-165, 168, 171-252, 295-300, 302-326, 394-434, 438-600, 800-801, 811-911, 934, 949, 951-952, 975-1023, Pl. XX:1-4, XXI:1-2, XXII:2-5,8-10, XXIII:2-5, 7-13, XXIV:7-9, XXV:1-16, XXVII:1,4-18, XXVIII:1-16, XXXIII:2-11, XXXIV:1-4, XXXV:1-16, XXXVIII:2-8, XLI:1, XLII:2-3,6-7, XLIII:21-22,24-27; Stępiński, Żabiński, Strzyż 2013, 174-175.

mentioned above, in 1412 iron was purchased for casting of projectiles for terrace guns (MKB 282).

As it was the case with firearms, another important centre of projectile manufacture was Gdańsk. In 1402, 120 stone cannonballs were made there and they were supposed to be sent to the Order's capital (MTB 183; Rathgen 1922, 23; 1928, 404; Schmidtchen 1977, 65). The same occurred again in 1403 (MTB 232).

Another centre of projectile manufacture in the Order was Toruń. Relevant data is known from 1409 (MTB 597; Schmidtchen 1977, 68) and in 1413 the inventory of the castle mentioned lead for projectiles (GÄDO 434; Nowakowski 2004, 227).

There is also data on the manufacture of projectiles in other centres of the Order. In 1409, 16 large stone cannonballs (*grose bochsensteyne*) were made at Labiau (Polesk) in the Commandery of Ragnit (MTB 532; Rathgen 1922, 28; 1928, 406; Stepiński, Żabiński, Strzyż 2013, 174). In the same year, expenses of the House Commander of Toruń for the newly seized castle of Bobrowniki in the Land of Dobrzyń also included lead for bullets (MTB 596). It can be therefore supposed that projectiles were to be made there. In 1410, the inventory of the Commandery of Kowalewo Pomorskie mentioned two picks for stone cannonballs (*bicken do man buchsensteyne mitte howt*) (GÄDO 412; Schmidtchen 1977, 36), which naturally implies a local manufacture of such projectiles. Analogous tools were also recorded in the Commandery of Brandenburg (Ušakovo) in 1422 (GÄDO 222). Inventories of the Commandery of Radzyń Chełmiński (Rehden) from 1411 and 1412 mention 2.5 Zentener of lead for projectiles (*bley czu gelothen*) (GÄDO 565, 567), which also suggests that projectiles were intended to be made there. A year after that, lead was mentioned among resources of firearms and gunpowder of the Commandery of Człuchów (Schlochau) (GÄDO 652). An interesting mention comes from the Commandery of Brodnica (Strassburg) in 1414. Among the resources of firearms at the castle there were 2 Zentener of lead (GÄDO 383). In 1415, there were 115 stones of lead, and within it there were also 1440 lead bullets (*doryn sind gewegen 24 schok gelote*) (GÄDO 384). Four years after that, there were 100 stones of lead, including the same amount of ready projectiles (GÄDO 386-387). Stores of lead recorded under lists of guns, projectile weapons, or generally military equipment are also known from the Commandery of Memel in 1416 (GÄDO 306), the Reveeship of Lipienek (Leipe) in 1416 (GÄDO 533), the

Commandery of Tuchola in 1417, 1422, 1431, 1437 and 1438 (GÄDO 638, 642-645), the Commandery of Papowo Biskupie (Papau) in 1419 and 1420 (GÄDO 519-520), the Reeveship of Tczew (Dirschau) in 1422 (GÄDO 726), the Commandery of Gniew (Mewe) in 1431 (GÄDO 748), or the Bailivate (later the Procurator's Office) of Neidenburg (Nidzica) in 1446, 1507 and 1508 (*Visitationen* 2002, 262, No. 123; GÄDO 358). Interestingly, the inventory of the Commander of Brandenburg from 1452 records a founding cauldron (*giskessel*) among the resources of guns and gunpowder (GÄDO 244; Stepiński, Żabiński, Strzyż 2013, 180).

Projectiles were also manufactured in Prussian towns. In 1404, the authorities of the Old Town of Elbing paid for a certain amount of lead. It was not said explicitly that it would go for ammunition, but this can be assumed based on the fact that this purchase was recorded among expenses for the expedition to Gotland (NKRSME 1987, 16). In 1410, as many as 1320 stone cannonballs of various size were made there upon the commission of the municipal authorities. Furthermore, there were expenses on preparation of tools for making such projectiles (NKRSME 1987, 230; EK 242; Chodyński 1996a, 17). From 1414, there is data both on expenses of stone cannonballs, as well as explicit mentions of manufacture of such projectiles in the town (NKRSME 1989, 79, 94; Szymczak 2004, 150).

Manufacture of gunpowder

It seems beyond doubt that the manufacture of gunpowder in the Teutonic Order was even more decentralised than in the case of projectiles. Mentions of stores of sulphur, saltpetre and charcoal can be found throughout the inventories and visitation reports (see GÄDO and *Visitationen*; Schmidtchen 1977, 28-42), and they are much too numerous to be dealt with individually. Therefore, only more relevant examples will be discussed.

Most naturally, the most significant manufacturing centre was Marienburg. There are mentions on large-scale acquisitions of saltpetre in 1401 (MTB 118-119). In 1402 and 1403, payments for gunpowder making were recorded (MTB 172, 217; Stepiński, Żabiński, Strzyż 2013, 171, 175). Data on purchases of saltpetre and sulphur is also available from 1404, 1405 and 1406 (MTB 287, 307, 321, 345, 348, 352, 381, 383). As it was the case with guns and projectiles, the Order's capital was also a manufacturing centre for the needs of other Teutonic castles. In 1407, there is a mention on the manufacture of 33 stones of gunpowder, which were then sent to Drezdenko (Driesen)

(MTB 446). Obviously, there was a clear increase in expenses on raw materials for gunpowder in 1408 and 1409 (MTB 482, 497, 507, 514, 573-574, 583-584; MKB 221). Records from 1411, 1412, 1413, and 1414 mention expenses on manufacture (AMH 9, 19, 20, 61, 71, 113-115, 143). In 1417, there are records of chopping and firing of lime wood for charcoal (AMH 278, 283; on lime wood for gunpowder manufacture see also, e.g., Szymczak 2004, 131-132).

With regard to other centres of the Order, the inventory of the Commandery of Osterode (Ostróda) from 1397 mentions three barrels of ready-made gunpowder (*tonnen gemachtes pulvers*) in the armoury (*harnaschkamer*) (GÄDO 319; Schmidtchen 1977, 33), which may imply its local manufacture. In 1401, the Treasurer paid for 4 pans for charcoal (*kolpffhannen*) and one gunpowder sieve (*pulversyp*). These items were bought for the castle of Gotteswerder by the House Commander of Königsberg. It could be therefore supposed that gunpowder was intended to be manufactured at the destination castle (MTB 127). From 1409 there is a record of manufacture of gunpowder in Elbing and in Neuteich (Nowy Staw) near Marienburg. Interestingly, this gunpowder was supposed to be then sent to the Order's capital. In all probability, this situation was related to availability of appropriate facilities, as the record mentions oil mills (*olemole*) in Elbing and Neuteich (MTB 587; Rathgen 1922, 83; 1928, 437). It cannot be excluded that the Order's workshops at Marienburg were simply too busy and it was necessary to look for alternative places. As mentioned above, in 1409 the House Commander of Toruń paid for lead for projectiles for the seized castle of Bobrowniki in the Land of Dobrzyń. His expenses for the needs of this castle also included 1 stone and 8 pounds of sulphur, as well as one iron pestle for beating gunpowder (*yserynne kolwe polfer domete yn zu stossen*) (MTB 596-597).

Concerning gunpowder manufacture in Prussian towns, there was a series of expenses on this purpose in 1410 in the Old Town of Elbing (NKRSME 1987, 229, 233; Świątosławski 1993, 26). Acquisition of sulphur and stores of gunpowder, sulphur and charcoal are also mentioned in 1413 (NKRSME 1989, 56; EK 253; Stepiński, Żabiński, Strzyż 2013, 183). New expenses were recorded in 1414 and they included purchase of ready gunpowder, sulphur, as well as manufacture as such (NKRSME 1989, 78-79; Świątosławski 1993, 26). With regard to other towns, there are

mentions of debts of the municipal authorities of Toruń for deliveries of sulphur and saltpetre from 1455, 1459 and 1462 (KDMT, 75-77, Nos. 55 and 57, 142, No. 110; Szymczak 2004, 124).

Internal organisation of acquisition

Firearms

With regard to the organisation of manufacture within the Order itself, one should first of all inspect what officials and/or other members or the corporation were involved and what tasks they fulfilled.

It seems that there was no one pattern of acquisition of raw materials for firearms manufacture. In 1401, part of copper for gun casting at Marienburg was bought by the House Commander of Gdańsk, for which he was reimbursed by the Treasurer³ (MTB 119). On the other hand, in 1403 some copper for this purpose was bought by the Grand Dispenser in Toruń. Moreover, in the same year a major part (4 Zentener and 20 pounds) of copper for casting of two veuglaires in the Order's capital came from the Order's resources, while 23.5 pounds were added by a bell-founder who cast these guns (MTB 217; Rathgen 1922, 24; 1928, 404; Schmidtchen 1977, 55-56). In 1408, two medium-sized guns were cast by a bell-founder Heinrich Dumechen, who used his own copper and charcoal. For all this plus his work, he was paid 85.5 Marks by the Treasurer (MTB 511; Rathgen 1922, 27; 1928, 406; Schmidtchen 1977, 58; Świątosławski 1993, 22; Szymczak 2004, 107, 109; Dąbrowska 2009, 39; Stepiński, Żabiński, Strzyż 2013, 173). On the other hand, the Grand Dispenser organised the acquisition and transport of a major part of tin and copper from Gdańsk to Marienburg for casting of the afore-mentioned *Grose Bochse* in 1408 (MTB 480, 501, 506). The same occurred in the next year, when one of the long cannons was cast in the Order's capital (MTB 591).

Mentions of the use of wood for gun carriages, stocks, shutters and other equipment are numerous (see below). It is, however, much less frequent that the sources record wood acquisition for firearms manufacture. In 1414, there were payments for servants (*knechte*) who acquired wood for gun stocks in a forest near Warnau (Kościeleczki) in the vicinity of the Order's capital (AMH 145; Chodyński 2010b, 189). In 1417, the same work in this forest was done not by the Order's servants, but by men from the village of Blumstein (Kamienica) in the vicinity of the Order's capital (AMH 252).

³ A. R. Chodyński states with right that House Commanders supervised the castle's handicraft, including weaponry manufacture (Chodyński 2010b, 187; see also Józwiak, Trupinda 2007, 366-369).

Fuel was obviously indispensable for gun casting. In 1409, a purchase of charcoal from the Order's fishing master in Mortecke (unidentified) near Mohrunge (Morąg) was mentioned with regard to expenses on the manufacture of the second largest gun (*Bochse nest der grosen*) (MTB 558). On the other hand, part of charcoal for this purpose was also acquired on a free market basis (*vom wasser gekouft*) (MTB 588; Rathgen 1922, 29; 1928, 406). In 1411, charcoal was acquired from the Order's estate in the Stuhm (Sztum) Forest and the delivery was organised by Heinrich Dumechen (AMH 25). There was another series of deliveries from this estate in 1412, also organised by Dumechen. On this occasion, a collier (*koler*) named Michel was mentioned (AMH 46). The same occurred in 1413 (AMH 91).

In 1399 a master gunner's court (*buchsen-schutzen hov*) was mentioned, which implies the existence of a specialised unit which dealt with problems of firearms (AMH, Anhang III, 464; Józwiak, Trupinda 2007, 160, 435-436). In 1401, 1402, and 1403 part of the Treasurer's expenses on gun manufacture was recorded under the heading "gun-founder" (*Buchsen-gisser*). Interestingly, these expenses encompassed not only gun casting as such, but also acquisition and transport of raw materials and a payment for making iron guns, which were in all probability assembled from iron rods and rims (MTB 119-120, 140, 217). Therefore, one should rather assume that the term *Buchsen-gisser* may have generally referred to a specialist or specialists dealing with gun manufacture than to a specific office. From 1408 there is a mention of a brother-knight Johann from Christburg who was to cast a gun, in all probability the afore-mentioned *Grose Bochse* (MTB 479, 510; Rathgen 1922, 27; 1928, 405; Schmidtchen 1977, 46-47, says that he may have been Johann von Rumpenheim, the Commander of Elbing in 1393-1404; Szymczak 2004, 185; Żabiński 2012, 31; Stepiński, Żabiński, Strzyż 2013, 171). It was not said, however, whether Johann held any office related to gun manufacture, or his role in the process was simply related to his competences (A. Nowakowski suggested that Johann was a supervisor of foundries at the Order's capital castle, Nowakowski 1994b, 334; see also Szymczak 2004, 185). Interestingly, brother-knight Johann was mentioned during the war in 1409 as a man who also had practical skills in operating firearms (*der mit der bochsen schuwest*) (MTB 587; Rathgen 1922, 32; 1928, 408; Schmidtchen 1977, 46-47; Żabiński 2012, 31; another mention of a brother-knight who was able to operate firearms comes from 1414, AMH 146).

From 1408 there comes another mention of a brother-knight who was to cast a gun, but his name was not stated (MTB 483; Rathgen 1922, 25; 1928, 405; Schmidtchen 1977, 53). Also in 1408 some unnamed gun-founders were mentioned with regard to casting of the *Grose Bochse* (MTB 502; Rathgen 1922, 27; 1928, 405). As mentioned above, the Order's Grand Dispensers participated in acquisition of raw materials for guns. In 1409, it was recorded that the Grand Dispenser paid for the manufacture of red brass pulleys for the *Grose Bochse's* stand (MTB 558). In 1412, the carpenter's office (*czymmeramph*) was mentioned with regard to the manufacture of gun carriages or stocks (*bochszenladen*) (AMH 51; on the role of this office see, e.g., Józwiak, Trupinda 2007, 431-433). In the same year, and also under the entry of the *Czymmeramph*, a certain Peter Lyndenaw was paid for carpentry work, including gun shutters. It could be perhaps supposed that he was an external specialist employed by this office (AMH 59). Two years after that, expenses recorded under the entry of the carpenter's office mentioned carpenters themselves and a master Peter (perhaps Peter Lyndenaw?) in the gun court (*bochssenhoff*) (AMH 135-137). In 1415, expenses for the carpenter's office mentioned a certain Niclos Juncfraw (again, perhaps an external specialist), who received help from four carpenters in making a shelter for wood. This wood was to be used for gun carriages or stocks (AMH 173). It was also in 1415 that the gun office (*bochsenampt*) was mentioned at the castle of Marienburg, which may have had its residence in the afore-mentioned gun court. Expenses on this office included various works, such as wood processing, acquisition of wire, wool, charcoal and clay, gun casting and making moulds (AMH 176). In 1417, the carpenter's office employed men from Blumstein, who did some building works on the foundry (*vor das gishuws czu heben*) (AMH 249; Józwiak, Trupinda 2007, 412; Dąbrowska 2009, 22). Another record concerning the House Commander's expenses on this office from this year mentions carpenters who helped a certain Hannus, referred to as a siege engine master (*blydenmeister* – of the Order?). The work they did concerned gun stocks or carriages and plastering of the foundry in the "stone court" (*czu bochszenladen unde das gissehus im steynhoffe czu latten*). Furthermore, a carpenter Holland and two other men helped master Hannus with gun stands (*bochsengestellen*) and some other tasks. Gun stands were also dealt with by Peter Wegener and four other men. One of them was referred to as an apprentice (*geselle*) which may suggest a craftsman from the town. Other works which were

mentioned included gun utensils (*bochsengerethe*) in the Karwan (the Order's wagon depot at the Low Castle) (AMH 268-269). Siege engine master Hannus was mentioned once again in that year, with regard to works on gun stocks or carriages and gun stands. He received help from a group of sawyers and carpenters, and a certain locksmith made necessary tools for him (AMH 278-279; Chodyński 2010b, 189). From 1417 there is also a mention of the masonry office (*muwerampt*), as two masons were paid for work at the foundry (*gishuws*) (AMH 273). Quite logically, the House Commander's expenses on the carpenter's office and sawyers were recorded as one entry in 1418. They concerned works on gun stands and the participation of siege engine master Hannos was mentioned (AMH 300-301). A year after that, expenses on this office concerned carpenters working on gun wagons, carriages and stands, as well as sawyers who sawed wood for them. Only one of these men, Peter (Lyndenaw?), was mentioned by name (AMH 327-329).

Another office which was obviously involved in gun manufacture was the smithing office. In 1404, the Grand Master bought one veuglaire of four parts for 9 Marks and the money went to the Order's smithing master (*smedemeister*). The cannon was sent to Gotland (MTB 309; Rathgen 1922, 24; 1928, 404; Schmidtchen 1977, 63; Świętosławski 1993, 22; Nowakowski 1994b, 335; Szymczak 2004, 107, 289; Stepiński, Żabiński, Strzyż 2013, 172; on smithing masters see Józwiak, Trupinda 2007, 433-434). The same occurred in 1408, when the smithing master received 8 marks for an *yserynne steynbochse*, which was sent to Samogitia (MTB 502; Schmidtchen 1977, 62; Świętosławski 1993, 22; Szymczak 2004, 80, 105; Stepiński, Żabiński, Strzyż 2013, 173).

As mentioned above, in 1401 a certain smith named Molner made 12 iron guns for the Order, for which he was paid 24 Marks by the Treasurer (MTB 119). It could be assumed that he was actually an external specialist working on the Order's commission. Another smith named Swenkenfeld was paid 1 Ferto in 1408 for nails used for the stand of the *Grose Bochse* (MTB 515; Rathgen 1922, 28; 1928, 406; Schmidtchen 1977, 70). A year after that, Swenkenfeld made shutters for a large gun wagon, fitted one gun on a carriage or cart (*1 bochse of eyne karren zu beslohen*), and did some other work (MTB 579, 588; Rathgen 1922, 31-32; 1928, 408; Dąbrowska 2009, 40). In 1403 it was recorded that gun casting was actually done by a bell-founder (*glockengisser*) (MTB 217). In 1408 the bell-founder Heinrich Dumechen was mentioned, who cast two guns

using his own copper and charcoal (MTB 511; Rathgen 1922, 27; 1928, 406). This specialist was also mentioned with regard to gun casting in 1409 (MTB 557-558, 591; Świętosławski 1993, 22). In 1411, Dumechen appeared again, and he was referred to as both a master gunner (*buchsenschotze*) and a bell-founder (*glagkengyszer*). In both roles, he received some money from the House Commander of Marienburg for payments to workers (*tagloner*) (AMH 9, 11; on bell-founders as gun-founders in general, and on the scope of duties of master gunners see, e.g., Schmidtchen 1977, 51-52, 56; Goetz 1985, 16-18, 35-55; Szymczak 2004, 168-206; Józwiak, Trupinda 2007, 435; Heś 2009, 138-139; on Dumechen see also Stepiński, Żabiński, Strzyż 2013, 171-172). Apart from that, certain servants (*knechte*) were recorded, who helped Dumechen prepare moulds and cast guns (AMH 25). Furthermore, it is known that Dumechen had a residence (*hus*) for himself somewhere at the castle of Marienburg, as construction expenses for this purpose were recorded in 1411 and 1413 (AMH 28, 33, 110; Steinbrecht 1911, 4; Józwiak, Trupinda 2007, 436; Dąbrowska 2009, 22; Chodyński 2010b, 190). Interestingly, from 1418 there comes a mention of expenses on the residence of master gunners (*vor dem buchsenschutzen hus*) near St Lawrence's Church at the Low Castle (AMH 316; Józwiak, Trupinda 2007, 95, 436). In 1411, certain men who helped Dumechen with casting and other works were mentioned by names (Hannus Mus, Niclus Menczel, Heinrich). It could be therefore supposed that they were somehow better qualified personnel (AMH 27-28). Hannus Mus may be identical with a founder (*gisser*) Muws, who was mentioned in 1417 under the entry of *Bochsenladen und buchsenngissen* (AMH 252; Chodyński 2010b, 190). Payments for Dumechen and servants for gun casting and related works were also recorded in 1412 (AMH 61-62, 68) and 1413 (AMH 104-105). Another master gunner named Herman was mentioned in 1412, when two carpenters made gun carriages or stocks for him (AMH 77; Chodyński 2010b, 190). The same occurred in 1413, when one of these carpenters was mentioned by name (Matthis Vrolich, AMH 101; see also AMH 117, 126), and in 1414 (AMH 136). Yet another master gunner Conrad was mentioned in 1415 with regard to expenses on the gun office in the Order's capital. He was involved in casting guns and making gun moulds. He also had a room (*stobe*) for himself, perhaps somewhere at the Low Castle (AMH 176; Rathgen 1922, 57-59; 1928, 421-422; Świętosławski 1993, 24; Chodyński 2010b, 190). From 1415 there is also a separate entry with expenses on Conrad. It records preparations of his room, payments for

carpenters making gun carriages or stocks, as well as for necessary tools for him (AMH 177). In 1409 a certain goldsmith Werner carved four shields in lead for guns (*vor 4 schilde in bly zu graben of dy bochsen*) (MTB 553; Engel 1897-1899, 230; Rathgen 1922, 28; 1928, 406). From the same year, there is a mention of Peter Werderer, a master gunner living in Gdańsk, who was to cast one of the afore-mentioned long cannons (MTB 554, 559; Engel 1897-1899, 231; Rathgen 1922, 28-30; 1928, 406-407; Schmidtchen 1977, 61). In this year another specialist from this city was recorded. His name was Steynkeller and he cast one of the Order's long cannons at Marienburg (MTB 590-591; Engel 1897-1899, 231; Rathgen 1922, 33 – this author says that Steynkeller came from Głogów (Glogau) in Silesia; 1928, 408, 410; Schmidtchen 1977, 60-61). Another record mentions a wheelwright Hannos Hoffeman, who manufactured wheels for cannons and gun carriages (MTB 562; Rathgen 1922, 30; 1928, 407; Schmidtchen 1977, 70-71). Finishing works, such as fitting gun stocks or carriages with iron, were done by a locksmith (*cleynsmed*) in 1409 (MTB 573; Rathgen 1922, 30; 1928, 407; Schmidtchen 1977, 70). In the same year, another smith named Jauwernig was mentioned. He fitted with iron a wagon for one of the long cannons cast in Gdańsk (*wayn zu beslohen zu der langen bochsen dy zu Danczk gegossen wart*) and did some finishing work on another four guns (MTB 573; Rathgen 1922, 30; 1928, 407; Schmidtchen 1977, 63, 71). A locksmith is also mentioned in 1411 (steel touch holes, other equipment and a lock – AMH 24, 28). Apart from iron fittings, another necessary part of gun equipment were ropes and straps of various kinds. Purchases of these from rope-makers (*seyler*) were mentioned in 1408 (MTB 511), 1409 (MTB 525, 574; Rathgen 1922, 28-30; 1928, 406-407). From 1411, there are mentions of money paid by the House Commander of Marienburg to carpenters (*czymmermanne*) for gun carriages or stocks (*laden ... czu den buchsen*) (AMH 20). In this year, a certain Sysen was mentioned, who was assisted by a group of unnamed men in chopping wood for guns (*dy Sysen holffen buchsenholz hauwen*) (AHM 36). In 1412, under the entry of *Buchzenladen*, a payment of the House Commander to two unnamed men was recorded (AMH 62). The House Commander's expenses for gun carriages or stocks were recorded under the same entry in 1413. At this occasion, apart from servants and paid workers (*mitknechte*), several specialists were mentioned: Symon, a carpenter Jocub, a master Peter and several unnamed carpenters (AMH 126). A similar situation occurred in 1414 (AMH 143, 148).

Expenses on the gun office in 1415 mentioned servants, carpenters, and sawyers (*brethsnyder*). Interestingly, it was also said that 17 men from Blumstein had been paid for helping the master gunner Conrad operate bellows as he was casting a gun (AMH 176). Men from this village also carried wood for a gun carriage (AMH 177). In this year, a locksmith was mentioned again, who provided Conrad with necessary tools (AMH 177). From 1416, there comes another mention of carpenters making *bossenladen* for Conrad (it was recorded under *Bochsenladen unde bochsen gissen*) (AMH 221). Expenses on sawyers were recorded as a separate entry in 1417 and two of them (Jurgen Stargart and Niclos Strol) were mentioned by name. The work they did encompassed sawing wood for gun stand and for some structure at the Karwan (AMH 271; Józwiak, Trupinda 2007, 406). From this year there is also a mention of a wheelwright (*rademacher*) Urban from Tczew (Dirschau), who made 24 wheels for gun carriages or carts (*bochsenkarren*) (AMH 279; Świętosławski 1993, 24). In 1418, there was a series of expenses recorded under the entry of *Bochsengestelle*. These were payments for carpenters helping the siege engine master and working independently on gun stands (AMH 305). Furthermore, in this year 10 wheels for gun wagons (*buchsenwaynen*) were bought from a cartwright (*wainer*) from Tczew (Dirschau) and a carpenter (*tischer*) was paid for three gun moulds (*buchsenformen*). Interestingly, these payments were recorded as common expenses (*Commune*) (AMH 311). The same occurred in 1419, when payments for *mitteknechten* who helped an unnamed gun-founder (*buchsenengisser*) with gun casting were mentioned (AMH 334). In this year, money paid to a master gunner (*buchsenchutz*) for a gun wagon lock (*slos ... czu buchsenwaynen*) was recorded under *Cleynsmedweg* (AMH 338). A rather bizarre situation took place in 1420. Expenses for paid workers (*tagloner*) and servants (*knechte*) who helped the gun-founder were recorded under *Commune* (AMH 354). On the other hand, a series of expenses for such servants, for gun stands and for files for the master gunner was recorded under transportation payments (*Furlon*) (AMH 357). Furthermore, there was also a series of expenses with no specified entry. They concerned payments for gun-founder Hannus and servants who helped him with gun founding. Furthermore, there was also a payment for men from the afore-mentioned village of Blumstein for help with operating bellows (AMH 358-359).

With regard to external specialists as master gunners in the Order, there are also numerous records concerning such men, but with no reference

to manufacturing of firearms. These mentions either simply record payments to master gunners, or also concern other duties they fulfilled. Among master gunners themselves, there are both men whose names have already been mentioned, as well as new persons. There are also mentions which simply record payments for master gunners, but state neither their names nor tasks they fulfilled, apart from mentions of places from and to which they were sent (e.g., MTB 99, 121, 198, 225, 229, 233, 239, 248, 270, 283, 299, 308, 310, 324, 430, 439). In 1399, a master gunner Engilhard received a significant payment of 40 Marks from the Commander of Balga (MTB 14). This specialist was in all probability mentioned in many later records under a diminutive name Engilke or Engelke (MTB 74, 116-117, 127, 181, 252, 257, 273). The fact that Engilke was paying a rent to the Marienburg Convent may imply that he held some property in the territory of the Commandery and may be thus regarded as a local resident (MKB 25). The same could possibly be said about a certain Niclus Buchsenshucze from the village of Katznase (Kaczynos) near the Order's capital, who was mentioned in 1399 and 1400 (MKB 4, 26). Interestingly, from 1402 there is also a mention of Andris, a brother of a master gunner Niclus (perhaps the afore-mentioned one?). Andris was supposed to help his brother in a military expedition in that year (MTB 172). Also in 1402, a master gunner Jacob vom Berge was mentioned, who was to take his post at Ragnit (MTB 171, 259). Other master gunners who were mentioned in that year were Heinrich Hemppel (an expedition to Samogitia), Peter von der Wille, and another (or the same) Peter (MTB 181, 190, 202). Another interesting record comes from 1403 and mentions a bell-founder who was employed as a master gunner in a military expedition of the preceding year (MTB 212, 269). Yet another mention from that year concerns a master gunner Hannus Missener, so perhaps a foreign specialist from Meissen (MTB 245; for other mentions on him see MTB 248, 250, 259, 384; Stepiński, Żabiński, Strzyż 2013, 171). It seems that he may have been a top-class professional, as he was assisted with another *buchsenschuez*, who was referred to as Hannus' servant (*knecht*) (MTB 248, 250, 259). From 1404, there are mentions of the following master gunners: Andris, Niclus Frunt from Gniew, an unnamed specialist from Neumark, Niclos, and Herman (MTB 299, 303, 311, 315-317; Stepiński, Żabiński, Strzyż 2013, 171). In 1405 and 1407, the only specialist who was mentioned by name in a non-manufacturing context was Niclus Flynst (MTB 341, 365, 440, 443). Interestingly, in 1407

Niclus was recorded as the specialist who built a mill at the new castle in Dobese in Samogitia (MTB 447). In 1406 there are also records of Hannus Mysener, and a new master gunner Hannus Lutke (MTB 384-385, 401, 408). From 1408, the sources mention Niclus Flynst and Peter, the master gunner from Christburg (MTB 462, 470, 474, 478, 483, 487-488, 495, 500, 514).

Data on master gunners in non-manufacturing contexts is much more numerous in 1409, due to the outbreak of the war with Poland and Lithuania. Apart from anonymous mentions (MTB 546, 554, 568), the sources record master Flinst, Heinrich Dumechen (mentioned as *glockengisser*), Wenczlaw, Herman and his companion – two master gunners from Braunschweig, or Peter Werderer (who participated in the expedition to Cuiavia) (MTB 536, 553, 555, 562). From this year, there is a group of entries which mention several master gunners participating in expeditions to Cuiavia and the Land of Dobrzyń. These were Johann, Peter Swalwen, Andris, Heinrich Dumechen, Hermann from Braunschweig with his companion, Flinst, Werner von Berge (or of dem Berge) from Gdańsk, and Peter Werderer (MTB 574, 576-580, 585-587; Stepiński, Żabiński, Strzyż 2013, 171). Most of these specialists were also recorded with regard to another expedition against Poland from late September 1409 (MTB 588, 597). Concerning the Braunschweig master gunners, a later record from 1409 mentions Hermann Hutter, who was returning home, and his companion Ulrich Kannengisser (MTB 588-589; Stepiński, Żabiński, Strzyż 2013, 171). With regard to the later period, the expense book of the House Commander of Marienburg mentions a payment for shoes for master gunner Hans in 1414 (AMH 147; Chodyński 2010b, 190; a list of master gunners was also compiled by Engel 1897-1899, 232-233).

As mentioned above, there were also some members of the Order who were able to operate firearms. Another record of this kind comes from 1433 and mentions a chaplain of the Commander of Chojnice (Konitz) who was also a master gunner. This chaplain was said to have inflicted considerable harm to besieging Polish-Hussite troops using a terrace gun (*tarrax buchse*) (*Ältere Hochmeisterchronik* 634-635; for a strongly distorted version see Grunau 1889, 111). Furthermore, in 1444 a brother-knight Heinrich Büchsenmeister was mentioned, so it could be supposed that his sobriquet had something to do with his actual skills (Regesta 1948, 1.1, 532, No. 8474). Another story comes from 1454 and concerns fights at the Order's capital castle. During hostilities, a young brother-knight was said to have fired a stone

cannonball gun and to have destroyed a boat of the attacking troops (*Ältere Hochmeisterchronik* 675).

New pieces of information on external master gunners in the service of the Order are available from the period preceding the Thirteen Years War. As early as 1442, during a convention of Prussian towns with the Grand Master in Marienburg, the burghers of Gdańsk complained that foreign specialists were deployed at the Order's castle in that city. According to the Order's response, there were only three master gunners in Prussia – two in the Order's capital (one of them died, and the other was sent to Toruń) and one in Gdańsk. The Order in fact employed foreign specialists, but this was said not to be intended against the Prussian estates (*Acten der Ständetage* 1880, 521-522, No. 342). In 1448, a master gunner Heinrich Crackleberg was mentioned (Regesta 1948, 1.1, 638, No. 9779). In 1451, a master gunner Johannes Bengedans offered his services to Grand Master Ludwig von Erlichshausen (Regesta 1948, 1.1, 693, No. 10656). On 16 November 1452, the Commander of Toruń informed the Grand Master about the arrival of a master gunner Hans, who said that he used to serve at the Imperial Court (*Acten der Ständetage* 1882, 510, No. 261). In March 1453, a certain master gunner from Nürnberg was supposed to arrive in Prussia. However, as the Commander of Gniezno reported to the Grand Master, the Prussian Confederates refused to let him through in spite of a request from the Duke of Saxony, as the specialist was supposed to serve the Order (*Acten der Ständetage* 1882, 596-597, No. 327). The matter was presented in a bit different way in a report from the convention of the Grand Master with the Prussian estates in Kwidzyn in late March 1453. According to the report, the Duke of Saxony wrote to Nürnberg concerning a master gunner Widersteyn, but the city refused, as the Duke wanted to send him to Prussia (*Acten der Ständetage* 1882, 619-620, No. 366).

Furthermore, there is also data from the times before and during the last war between the Teutonic Order and Poland. In 1514, a certain master gunner was to be sent from the Imperial Court to the Grand Master (Regesta 1973, 1.3, 51, No. 20043). From this year there is also a letter of Lorenz Bishop of Würzburg to the Grand Master, in which Bishop Lorenz said that a master gunner Conrad refused the invitation to Prussia (Regesta 1973, 1.3, 74, 20489). In 1517, two specialists were sent to the Grand Master from Prague. These were a military building master Georg von Poulneut and a Royal master gunner Dietrich Jemminger (Regesta 1973, 1.3, 127, No. 21445). The latter may be identical

with Dietrich von Gemmyngen, who was frequently mentioned in 1522-1523 (Regesta 1973, 1.3, 349, No. 25545, 352, No. 25592, 352-353, No. 25605, 354, No. 25631, 402-403, No. 26477, 408, No. 26570; for other mentions of master gunners see Regesta 173, 1.3, 176, No. 22390, 399-400, No. 26431).

Concerning the organisation of gun acquisition in Prussian towns, data is much more sparse. In 1410, a certain Nicolaus was paid 1 Mark 8 Scot for making one lead bullet gun (*lothbusse*) upon the commission of the Old Town of Elbing (NKRSME 1987, 217; EK 242; Rathgen 1922, 67; 1928, 427; Świętosławski 1993, 21). In the same year, a bell-founder (*klokkengeter*) from Heilsberg (Lidzbark Warmiński) made several guns of various kind for the authorities of the town (NKRSME 1987, 217; EK 242; Rathgen 1922, 67; 1928, 427; Chodyński 1996a, 17; Szymczak 2004, 186; Stepiński, Żabiński, Strzyż 2013, 183). Furthermore, a payment to a certain Herman Wernersson for two guns was recorded, but it was not stated whether he was also the manufacturer of these firearms or not (NKRSME 1987, 218; EK 242; Rathgen 1922, 67; 1928, 427; Świętosławski 1993, 24, 26, 27; Stepiński, Żabiński, Strzyż 2013, 183). Also in 1410 a certain bullet founder (*lotgheter*) who cast bullets and guns was mentioned in this town (NKRSME 1987, 229; EK 242; Rathgen 1922, 68; 1928, 427; Świętosławski 1993, 21; Szymczak 2004, 109, 186). Apart from that, 30.5 Marks were paid to a certain Bomgarden for gun casting (NKRSME 1987, 229; EK 242; Rathgen 1922, 68; 1928, 427). The afore-mentioned bell-founder from Heilsberg (Lidzbark Warmiński) was probably identical with master Herman from that town, who cast another five guns for the authorities of the Old Town of Elbing in 1410. Interestingly, part of raw materials used for these firearms belonged to the master himself (NKRSME 1987, 229; Rathgen 1922, 68; 1928, 427; Świętosławski 1993, 21; Szymczak 2004, 109). From this year there is also a very interesting mention of a master Johann, a carpenter from the Teutonic castle in Elbing (*des huses tymmerman*), who made gun stands (*bussenstelle*) for the municipal authorities (NKRSME 1987, 229; Rathgen 1922, 69; 1928, 428). A carpenter and sawyers making gun stands in the town were also recorded in 1411, but it was not said who they were (NKRSME 1989, 31; Chodyński 1996a, 17; Szymczak 2004, 115). In 1414, a cartwright was mentioned, who made seven *lotbussenladen*, two wheeled stands or carriages for large guns (*wagengestelle czu den grosen bussen*) and two ladders for gun wagons (? – *leteren uff dy bussenwagen*) for the municipal

authorities (NKRSME 1989, 79, 84; EK 260; Świętosławski 1993, 24 – this scholar assumes that this mention concerns lanterns; Chodyński 1996a, 17; Szymczak 2004, 114). In the same year, two smiths – Stregener and Vasolt were recorded, who mounted a gun in its carriage or stock and fitted gun wagons and ladders with iron (NKRSME 1989, 95; Chodyński 1996a, 18).

With regard to other Prussian towns, in 1453 the authorities of Toruń paid 20 Marks to a woman named Conradyne with regard to one gun (*von wegen vff dy buchse*). No other details were stated (KT 162). Nine years after that, a certain Caspar Blozsil gave two guns of a total weight of 32 pounds. This was due to his debt of 21.5 Marks and 2 Scot to the town (KKMT, No. 36).

Prussian towns also employed external specialists as master gunners in periods of hostilities. From 1410 there is a mention of a travel of an envoy of the Old Town of Elbing to a master gunner in Heilsberg, probably the afore-mentioned master Hermann (NKRSME 1987, 221). An intriguing record comes from 1411, when the town authorities paid 4 Marks to a cutler from Christburg, who held himself for a master gunner (*der sich vor eynen buchschotzen hilt*) (NKRSME 1989, 10; see also NKRSME 1989, 31). Furthermore, in all probability local specialists also appeared in the course of time. A register of burghers and their military equipment for the purpose of defence of the town walls (*Registrum de custodia murorum*) from Elbing from 1432 also mentions a master gunner (*buchschutze*) (EK 271).

During the afore-mentioned convention in Marienburg in 1442, the Order accused the authorities of Gdańsk of deploying guns against the Order's castle and employing a master gunner from Lübeck. The burgomaster confirmed that it was necessary to employ someone to supervise the city's guns, as the previous master gunner died. However, there was only one master gunner in the city (*Acten der Ständetage* 1880, 525, No. 342). Furthermore, during another convention in Kwidzyn in April 1454, the Grand Master accused the estates of intending to employ master gunners from the Imperial Court (*Acten der Ständetage* 1882, 626-627, No. 375). In 1454, a certain master Hanns, who referred to himself as a founder (*gysser*) offered his competences to the municipal authorities of Gdańsk. He wrote that he was able to cast cannons capable of firing high (*in dy hoge zcu schyssen*) at towers, castles and towns (Engel 1906-1908, 118-119; Rathgen 1922, 92-93; 1928, 441-442; Możejko 2000, 171-176; Szymczak 2004, 186, 188, Fig. 28; Strzyż 2011, 46). Numerous payments made by the authorities of Toruń

to master gunners employed by the Prussian Confederacy were recorded during the Thirteen Years War. The following masters were mentioned – Hans, Jacob, and Niclas (KT 28, 164, 166, 262; KKMT, Nos. 24, 36; Biskup 1967, 124, 204, 252). Furthermore, a certain Paul Buchsschucze was mentioned in that town about 1470 (KKMT, No. 36).

Projectiles

Organisation of projectile acquisition within the Order also involved numerous officials and specialists (for some general remarks see Arszynski, Sikorska-Uflik 1990, 70-71). In 1402, when stone projectiles for Marienburg were made at Gdańsk, the Treasurer reimbursed the local House Commander for expenses (MTB 183). It was therefore this official of the Order who organised the manufacturing process. When a new series of projectiles for the Order's capital castle was made at Gdańsk in 1403, it was explicitly said that the manufacture was done upon the order of the local House Commander (*der huskomphur von Danczk his die steyne hauwen*) (MTB 232). An official of the same rank was also mentioned in 1403 with regard to the manufacture of stone projectiles for the castle of Ragnit and iron shots for Memel. In both cases, the expenses were paid for by the House Commander of Königsberg, for which he was reimbursed by the Treasurer (MTB 246-248; Rathgen 1922, 24; 1928, 404; Schmidtchen 1977, 69). The same occurred in 1409, when the Treasurer reimbursed the House Commander of Marienburg for his payment to a stone-cutter Hannos for making of 122 stone projectiles for medium-sized guns (*mittelbochsen*) (MTB 545). Moreover, in the same year the House Commander of Toruń paid for expenses on lead for projectiles for the castle of Bobrowniki, on preparing of stones for stone cannonballs, and on making four stone projectiles for a cannon of the Grand Marshall (MTB 596-597). Furthermore, there is a series of expenses on projectile manufacture in the account book of the House Commander of the Order's capital castle (AMH 6, 11). An interesting pattern of organisation of manufacture of stone projectiles can be seen in 1411 at Marienburg. The Treasurer paid a sum of money to the smithing master (who was the Order's official). Then, the smithing master paid this money to a smith in Sobowidz (Sobowitz) for sharpening of picks, as stone-cutters were making stone cannonballs (MKB 252). As said above, in 1412 the smithing master organised the purchase of iron for casting of projectiles for terrace guns (MKB 282).

With regard to relevant specialists, in 1401 a stone cannonball cutter (*buchsensteynhouwer*) was paid by the Treasurer for making stone projectiles for the needs of the castle of Gotteswerder (MTB 117; Rathgen 1922, 22; 1928, 403). In the same year, among the Treasurer's expenses for the gun-founder (*Buchsengysser*), there were also payments for making stone projectiles of various size (MTB 119-121). It could be therefore tentatively assumed that one and the same specialist supervised the manufacturing process of both guns and projectiles. In 1403, the Treasurer's expenses for stone projectiles were recorded under a separate entry (*Buchsensteyne*), and a stone-cutter Hannus received a payment for part of this work (MTB 212; Schmidtchen 1977, 65). In 1407, expenses for bullet manufacture were recorded together with those for gunpowder (*Polfer zu machen und gelote*). It was also said that 3 Zentener of lead bullets were cast by a bell-founder (*glackengisser*) from Marienburg (MTB 446; Rathgen 1922, 53; 1928, 419; Świętosławski 1993, 25; Szymczak 2004, 156). It could perhaps be assumed that he was a urban craftsman working for the needs of the Order. In 1408, payments of the Treasurer to a stone cannonball cutter Belgart and his associates for making stone cannonballs were mentioned. These were recorded as other expenses (MTB 495, 497; Rathgen 1922, 26; 1928, 405; Schmidtchen 1977, 68; Stepniński, Żabiński, Strzyż 2013, 175). On the other hand, payments for casting of lead projectiles and to a stone-cutter Hannos (perhaps the same as the specialist mentioned in 1403) were recorded under the entry of *Bochse und gelote zu gissen* (MTB 511; Rathgen 1922, 27; 1928, 406; Schmidtchen 1977, 68; Świętosławski 1993, 25; Szymczak 2004, 150; Dąbrowska 2009, 40; Chodyński 2010b, 191). As mentioned, manufacture of stone cannonballs in the village of Sobowidz near the Order's capital was mentioned in 1409. The Treasurer's expenses for this purpose also encompassed payments for sharpening of picks (*steynbicken*) for stone-cutters (MTB 523). Another series of expenses for the manufacture of projectiles (both lead and stone ones) also mentioned the stone-cutter Hannos, who was paid for making of stone projectiles in Sobowidz (MTB 571-572; Rathgen 1922, 30; 1928, 407). In 1410, the account book of the House Commander of Marienburg mentioned payments to another two specialists, Frozen and Hertwig, for making stone projectiles (*buchsensteyne czu hauwen*). Interestingly, these payments were recorded under a separate entry of *Steynhawen* (AMH 6; Chodyński 2010b, 191). The same pattern (with a slightly modified form of *Steynhawern*) can be seen in 1411 (AMH 11).

With regard to projectile acquisition in Prussian towns, there is data from the Old Town of Elbing from 1410. The account book mentions expenses for stone projectiles of various size, as well as for preparation of necessary tools (picks and hammers) for making such projectiles (NKRSME 1987, 230; EK 242). In 1414, the afore-mentioned smith Stregener was paid for one ring used for making stone cannonballs (*ring do man dy steine czu den buchsen durchhib*) (NKRSME 1989, 94).

Gunpowder

Analogously to the organisation of acquisition of projectiles, it seems that a considerable role was played by local House Commanders. In 1404, the House Commander of Marienburg purchased sulphur, for which he was reimbursed by the Treasurer (MTB 307). The same took place in 1405 with regard to saltpetre – interestingly, it was stated that it was purchased from a certain Nicholaus, the scribe of the Grand Master (MTB 346; Józwiak, Trupinda 2007, 205). In the same year, it was also the House Commander who purchased saltpetre and sulphur from Johann of Toruń (MTB 352). In 1406, there is a record of a purchase of saltpetre by the Reeve of Stuhm (MTB 281). In 1408, it was again the House Commander of the Order's capital castle who paid for saltpetre which was bought in Wrocław and then transported to Toruń (MTB 482).

Concerning specialists who participated in the manufacture of gunpowder for the needs of the Order, it is interesting that in many cases they were people who also dealt with gun manufacture. In 1402, the Treasurer paid a certain bell-founder for making gunpowder as part of expenses on a military expedition in July (MTB 172). The same occurred in 1403 and the expenses were recorded under the entry of *Buchsengysser*. As it was said that the bell-founder had been paid an identical sum of money for making gunpowder in the preceding year (MTB 217), it could be assumed that he was one and the same specialist. It was as late as 1407 that the Treasurer's expenses on it were listed under a separate entry (*Polfer zu machen und gelote*) (MTB 407). In 1408, there was a separate entry for the purchase of saltpetre (MTB 497), which can also be seen in 1409 (MTB 573). Interestingly, in 1409 the Treasurer recorded certain expenses on master gunners and some money was spent on wood for shutters in the castle's terraces, used to make gunpowder (*sparholzer zu den schuwer im parcham, polfer zu machen*) (MTB 574). This may imply that master gunners were also involved in gunpowder manufacture (MTB 574). A very interesting pattern can be seen in the afore-

mentioned case of manufacture of gunpowder in Elbing and in Neuteich near Marienburg in 1409, which was recorded under the entry of *Polfer machen*. The master gunner Andris received a payment for his two-week travel concerning the manufacture. Then, a brother-knight (*her*) Claws commissioned the manufacture in a horse-driven oil mill in Elbing for two times. In the meantime, there was a mention of purchase and manufacture of barrels. Interestingly, eight barrels were bought from the guardian of the lowest gate at the Order's capital castle (in all probability, this was the entrance to the present-day Middle Castle, see Józwiak, Trupinda 2007, 236-237). There were also payments for the transport of sulphur and saltpetre to Elbing, as well as for lime wood charcoal. With regard to the transport of ready gunpowder, one mentioned both transport by ship and by wagons. As regards the manufacture in Neuteich, the process was also commissioned by a member of the Order, a brother-knight Kulman. The manufacture was directly supervised by Sweczer, a master gunner from Gdańsk, who travelled with his wife to the Order's capital. This record ends with a mention of a payment for the wife of the afore-mentioned master gunner Dumechen, as she was making gunpowder in Elbing (MTB 587; Rathgen 1922, 31; 1928, 408; Schmidtchen 1977, 47-48; Nowakowski 1994b, 335; Szymczak 2004, 140; Stepiński, Żabiński, Strzyż 2013, 171).

In 1411, there was a series of payments related to gunpowder manufacture at the Order's capital castle. These payments were partially recorded under a separate entry of *Polferstosen* and partially under common expenses. Concerning the personnel involved in the manufacture, workers (*tagloner*) and servants (*knechte*) were mentioned. Interestingly, at least part of this work took place in a specialised atelier, i.e., a gunpowder chamber (*pulverkamer*) (AMH 9, 19-20). In 1412, part of expenses related to gunpowder manufacture was recorded under the entry of *Buchsengissen*. This mention also says that the specialist who was paid for making gunpowder was the well-known master gunner Dumechen (AMH 61; Świątosławski 1993, 27; Chodyński 2010b, 190). Furthermore, there were payments for inhabitants of the afore-mentioned village of Blumstein, who transported saltpetre to the Order's capital (AMH 71). In 1413, the main role in gunpowder manufacture at the Order's capital castle seems to have been played by the master gunner Herman, who was assisted by a group of servants (*knechte*). Interestingly, payments for this purpose were recorded as common expenses (AMH 113-114). On the other hand, a series of expenses on gunpowder manufacture in 1414 had

its own entry of *Polver stossen* (AMH 143; Świątosławski 1993, 27). In 1417, the relevant entry was named *Polfer machen*, and recorded expenses included payments for chopping of lime wood for charcoal and firing of charcoal. Part of this work was done by the afore-mentioned collier Michel (AMH 278). On the other hand, some payments for apprentices (*gesellen*) who helped fire the charcoal were recorded under common expenses (AMH 283).

Again, less is known about the manufacture of gunpowder in Prussian towns. In 1410 the account book of the Old Town of Elbing mentioned purchases of sulphur, saltpetre and lime wood charcoal. Furthermore, there were expenses on milling the charcoal in a mill, and on making and sieving of gunpowder. Eventually, the municipal authorities purchased sacks and barrels for it (NKRSME 1987, 229, 233; Rathgen 1922, 69; 1928, 428; Świątosławski 1993, 24-27; Szymczak 2004, 119, 149; Stepiński, Żabiński, Strzyż 2013, 183). Expenses on saltpetre and sulphur are also known from 1411, 1413 and 1414 (NKRSME 1989, 32, 56, 78; Świątosławski 1993, 26); furthermore, considerable resources of raw materials for gunpowder manufacture (sulphur, charcoal) were recorded in the Town Hall in 1413 (EK 253; Rathgen 1922, 71-72; 1928, 429-430; Chodyński 1996a, 20-22; 1997, 77-78; Stepiński, Żabiński, Strzyż 2013, 180). In 1414, apart from purchases of gunpowder and sulphur, there was also a payment for a master Degener for gunpowder making. The account book also recorded expenses on preparation of equipment for gunpowder beating and payments for servants (*knechte*) for their work. Eventually, it was said that the process of beating of saltpetre, sulphur and charcoal had taken place in the Town Hall (NKRSME 1989, 79; Rathgen 1922, 70-71; 1928, 428-429).

Issues of transport

Some questions related to transport of firearms, gunpowder, projectiles, raw materials for their manufacture or personnel have already been dealt with above. In this place, selected issues can be examined in a more detailed manner. With regard to officials of the Order who were involved in the organisation of transport, it seems again that there was no definite pattern. In some cases there are mentions that transports were paid for by local House Commanders, which implies a role of this category of officials. This was the case in 1401 and 1403 at Königsberg (the transport of projectiles and gunpowder to Gotteswerder, MTB 127; the transport of projectiles and guns to Ragnit and Labiau, MTB 246-247; see also Schmidtchen

1977, 70; Stepiński, Żabiński, Strzyż 2013, 185), or in 1402 at Marienburg (MTB 193). Furthermore, in 1409 the House Commander of Grudziądz paid for the transport of two large stone cannonballs (MTB 578), and the House Commander of Toruń dealt with a series of transports of guns, gunpowder and projectiles (MTB 596-597). Sometimes, transport expenses were also covered by other officials. A transport of gunpowder from Gotland to the Order's capital in 1408 was paid for by the Grand Dispenser from Marienburg (MTB 464). In 1409, during the afore-mentioned expedition to the land of Dobrzyń, the Commander of Golub (Gollub) paid for the transport of eight large stone projectiles to Bobrowniki (MTB 576; Rathgen 1922, 31; 1928, 407). In the same year, the Commander of Świecie (Schwetz) paid for the transport of projectiles to his home castle (MTB 589). From 1409 there is also a mention of the transport of 14 stone projectiles for the Order's largest cannon. These projectiles were sent from Elbing to Brodnica and the transport was organised or supervised by a brother-knight Lewe, the garden master from Elbing (MTB 591; Stepiński, Żabiński, Strzyż 2013, 183). In 1411, a certain Haselaw was paid for his work with shipping of the large cannon. This payment was recorded as part of expenses of the carpenter's office at Marienburg (AMH 17). On the other hand, in most cases expenses on transport were simply recorded as "other" or "common" ones (MTB 311, 428, 493, 574, 582; AMH 19, 22, 33, 35, 36-37, 69, 111, 113, 116, 118, 145-148, 184, 224, 280, 283, 287). In 1419, relevant expenses for transport were recorded under the entry of transport payments (*Furlon*) (AMH 336).

As regards the organisation of transport as such, in most cases the sources simply mention the name and trade of a given specialist. In 1402, the transport of some goods, including two guns (*buchsen*) from Rastenburg (Kętrzyn) to the Order's capital was carried out by a wagoner (*furmann*) Rudel (MTB 193). In 1404, a skipper (*schiffman*) Hannus Klapschencken transported a number of weapons, including firearms and projectiles to Marienburg in two ships (MTB 311). An unnamed wagoner was mentioned in 1407, with regard to a transport of gunpowder and crossbows to Schivelbein (Świdwin) (MTB 428). A year after that, a skipper Hynrich Kemmyn transported master gunners and six other men, for which he was paid 19 Marks (MTB 493). In 1409, the afore-mentioned large cannon was transported by the Order's servants from the Karwan (*karwansknechten*) (MTB 577; Rathgen 1922, 31; 1928, 407; Żabiński 2012, 38). From this year there is also more detailed data concerning the transport of this gun

for the needs of the Dobrzyń campaign. Four men with eight horses were involved for 15 days; furthermore, it was also necessary to transport 14 large stone projectiles and four horses were needed for each one. The main part of the way was perhaps made by water, as there was a mention of carpenters who unloaded the cannon from the ship. The entire transport was perhaps supervised by the master gunner Dumechen, who accompanied the gun wagon (*als her by dem bochsenwayne reyt*) (MTB 577-578; Żabiński 2012, 38). Numerous other instances of transport by water are known from 1409 as well. Damaged guns from Balga were transported from Toruń to the Order's capital in a ship (MTB 583; Rathgen 1922, 32; 1928, 408; Schmidtchen 1977, 64; Stepiński, Żabiński, Strzyż 2013, 181). A skipper Bartusch transported stone cannonballs to Świecie (Schwetz), when a military expedition to Cuiavia was prepared. During this expedition, another skipper Jokup Stuwernayl transported guns and stone cannonballs of a total weight of 9 Last (MTB 589-590). Expenses of the House Commander of Toruń from 1409 record several cases of transports: guns and stone cannonballs by ships; gunpowder and utensils (*gerethe*) by a wagoner; a gun called *Vellemuwer* (Wall-Breaker) to the Order's capital by a wagoner Kobir; another gun to Marienburg by a skipper; a number of stone cannonballs to Świecie by ship; and a clamp for a gun trestle (*den cloben zum bochsenbocke*) to the same place by a wagoner (MTB 596-597). Wagoners and servants were also mentioned in 1411; furthermore, there was a payment for 11 men from the village of Blumstein near the Order's capital who helped with shipping of the large cannon and stone projectiles (AMH 19, 22, 33, 35, 36-37). Analogous mentions are known from 1412, 1414, 1415, 1417 and 1419 (AMH 111, 113, 116, 118, 145-148, 184, 224, 280, 283, 287).

Some pieces of information are also available with regard to Prussian towns. In 1410, a certain skipper transported guns upon the commission of the Old Town of Elbing (NKRSME 1987, 229). In the same year, the municipal authorities paid 3 Marks and 6 Scot to 23 men for six days of work during the transportation of guns and stone cannonballs (NKRSME 1987, 241; EK 250; Stepiński, Żabiński, Strzyż 2013, 183). This was in all probability the town's help for the Polish-Lithuanian troops during the siege of the Order's capital. A year after that, there was a series of expenses on carrying of guns, stone projectiles and stands to the town's towers and the Town Hall (NKRSME 1989, 31; Świętosławski 1993, 24). The same can be seen in 1414; apart from that, the municipal authorities also paid for the transport

of a master gunner from Gdańsk (NKRSME 1989, 80). Concerning the town of Toruń, there is some data from the period of the Thirteen Years War. In 1454, the municipal authorities paid 18 Marks to Augstin Lebenbrost who transported gun shutters and stone projectiles with a boat to Kwidzyn (KT 164). A water route was also used for sending shutters and guns for the siege of Stuhm. Furthermore, there were payments for porters who loaded gunpowder, stone projectiles and other goods to a ship (KT 165). In late 1455-early 1456, the town council paid certain apprentices (*gesellen*) who transported a large cannon from Grudziądz (KKMT, No. 32; Biskup 1967, 407).

Conclusions

As regards the acquisition of raw materials, copper and tin for gun casting were obviously imported, and one can assume that Upper Hungarian resources played a significant role. Purchases were organised by the Order's Grand Dispensers, but in some cases metals were also bought from local craftsmen. For iron, import of Swedish osmund may have been significant, but it seems to be difficult to assess its share as compared with iron from other sources. Another category of imported materials were those for gunpowder manufacture (saltpetre).

The Teutonic Order strongly relied on their own manufacture of firearms. Mentions on purchases of such weapons are usually late and they can easily be related to internal difficulties of the Order's state in Prussia in the last decades of its existence, which may have rendered large-scale own manufacture difficult. On the other hand, external commissions of firearms seemed to play a more considerable role for some Prussian towns, which is testified to by mentions of purchases of guns in Gdańsk by the municipal authorities of the Old Town of Elbing.

The main centre of manufacture and repair of guns for the needs of the Order was obviously the Order's capital. Other centres included Gdańsk, and minor works and repairs may have also been done in other possessions of the Order. In the last decades of the existence of the Order's state in Prussia it was perhaps Königsberg that became the main centre of manufacture. It can be generally said that the organisation of gun manufacture within the Order was strongly centralised. With regard to gun manufacture in Prussian towns, relevant data is available for Gdańsk, Elbing and Toruń.

Concerning gun projectiles, their manufacture for the needs of the Order was definitely much more decentralised (see Nowakowski 1994b, 335).

Most data naturally concern Marienburg, but there are also pieces of information pointing to Königsberg, Gdańsk, Toruń, Labiau, Kowalewo Pomorskie and other centres. As regards the manufacture of projectiles for the needs of Prussian towns, data is known from Elbing, but it can be assumed that projectiles were also made elsewhere.

It seems that own manufacture also dominated concerning the acquisition of gunpowder by the Order. Furthermore, it was almost certainly even more decentralised than in the case of projectiles (*ibidem*, 335). Direct data on gunpowder manufacture is available for Marienburg and Elbing. On the other hand, stores of raw materials for gunpowder manufacture are mentioned throughout inventories and visitation reports from Teutonic castles. Concerning Prussian towns, manufacture of gunpowder is mentioned in Elbing and Toruń.

The issue of internal organisation of acquisition is quite complex. Concerning the manufacture of guns for the needs of the Order, raw materials were bought by Grand Dispensers and local House Commanders. Sometimes raw materials were also supplied by specialists who manufactured firearms. Charcoal was in most cases acquired from the Order's own estates. With regard to specialists who carried out the manufacture process, it is certain that some members of the Order possessed necessary skills and competences and who were also able to operate firearms in the field. Apart from that, specialised offices dealt with individual stages of manufacture. Concerning the castle of Marienburg, one can mention here the carpenter's office, the gun office, the smithing office or the siege engine master. Obviously, the Order's foundry must also be mentioned here. On the other hand, it seems that the main role was anyway played by external specialists. It is of special interest that their skills and competences were manifold. One and the same person could be a bell-founder, a gun-founder, a gunpowder-maker and a master gunner who both supervised the manufacture of other necessary resources (such as gunpowder) and operated firearms in the field. These specialists came both from the Teutonic Order's state and from abroad. Other craftsmen involved in the process of gun manufacture were locksmiths, wheelwrights, goldsmiths, rope-makers, carpenters, cartwrights, sawyers and other auxiliary personnel.

Much less data is available for gun acquisition by Prussian towns. On the other hand, there are mentions of specialists who manufactured guns for the needs of municipal authorities. Some of them came from other centres of the Order's state, while others may have been local craftsmen.

With regard to the organisation of acquisition of projectiles for the needs of the Order, it seems that local House Commanders played a considerable role in the process. Specialists who dealt with the manufacture were stone cannonball cutters, bell-founders, smiths and auxiliary personnel. A strong role of local House Commanders can also be seen in the organisation of gunpowder manufacture within the Order. It is interesting that the very process of manufacture was often supervised by the same people who dealt with gun manufacture.

All in all, there were definitely many ways and patterns of acquisition of firearms and related equipment in the Teutonic Order's state in Prussia. It seems perfectly comprehensible that for their own needs the Order intended to be possibly independent from external sources and attempted at manufacturing as much as possible on their own. On the other hand, a complete independence was definitely impossible. Apart from necessary import of raw materials which were unavailable locally, the Order also had to rely on external specialists to supervise the manufacturing processes. There was a various degree of centralisation of manufacture

– with regard to firearms as such, a strongly centralised pattern was in all probability caused by a need to construct expensive and complex facilities. Furthermore, issues of security may have also been significant here. On the other hand, a decentralisation of manufacture of projectiles and gunpowder was no question much more possible and practical.

Much less is known on Prussian towns, which is first of all caused by the source basis. It can be said, however, that the largest and most important urban centres, such as Gdańsk, Elbing and Toruń attempted at developing their own manufacture. From a point of view, they may have faced the same difficulties as the Order did, concerning, e.g., the organisation of supplies of raw materials or necessity to employ external specialists.

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SPOSOBY POZYSKIWANIA BRONI PALNEJ I ZWIĄZANEGO Z NIĄ WYPOSAŻENIA W PAŃSTWIE ZAKONU NIEMIECKIEGO W PRUSACH

Streszczenie

Artykuł omawia organizację zaopatrzenia w broń palną i związane z nią wyposażenie w państwie zakonu niemieckiego w Prusach. Dwoma głównymi czynnikami generującymi popyt na broń palną były sam zakon oraz miasta pruskie. Zakon niemiecki zasadniczo wytwarzał znaczną większość broni palnej, prochu i amunicji we własnym zakresie. Wydaje się, że dopiero w końcowym okresie istnienia zakonu w Prusach znaczącą rolę zaczęły odgrywać źródła zewnętrzne. Produkcję na własne potrzeby organizowały też miasta pruskie, acz w tym przypadku wyraźnie widoczna jest wiodąca rola największych ośrodków, z Gdańskiem na czele.

Organizacja produkcji broni palnej w zakonie miała charakter wyraźnie scentralizowany. Pod koniec XIV i w pierwszych dziesięcioleciach XV w. głównym ośrodkiem był sam Malbork, acz pewną rolę odgrywał też Gdańsk. Związane było to zapewne zarówno

z kwestiami finansowo-organizacyjnymi (nakłady na niezbędną infrastrukturę), jak i sprawami bezpieczeństwa. Z drugiej strony, produkcja amunicji i prochu odbywała się w wielu lokalnych ośrodkach.

Artykuł omawia też rolę i znaczenie poszczególnych urzędów zakonnych oraz zewnętrznych specjalistów w produkcji broni palnej i związanego z nią wyposażenia. Acz wśród członków korporacji zakonnej znajdowali się bracia posiadający kompetencje zarówno w wytwarzaniu, jak i operowaniu bronią palną, niezbędnym było korzystanie z pomocy zewnętrznych specjalistów. Zwraca uwagę, iż często jeden i ten sam specjalista spełniał szereg różnych funkcji – od organizacji produkcji broni palnej, poprzez wytwarzanie prochu, aż wreszcie do praktycznego wykorzystania broni w warunkach wojennych.

Tłumaczenie Grzegorz Żabiński