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## SIEGE ARTILLERY IN POLAND IN THE FOURTEENTH AND THE FIFTEENTH CENTURIES

The use of firearms in Poland is first recorded in 1383, and refers to siege artillery. During a four-day siege of the town of Pyzdry in Great Poland, which took place between January 12<sup>th</sup> and January 15<sup>th</sup>, the attackers used a red bronze gun. A stone ball fired from it pierced a double town gate and hit Mikołaj, the vicar of Biechowo, who was standing on the other side. The projectile hit Mikołaj so hard that he died<sup>1</sup>. The vicar of Biechowo is the first firearm victim in Poland mentioned in written sources.

Firearms played an important role in the fights against Władysław Opolczyk, which took place from May 1391 onwards. The royal forces were equipped with large quantities of saltpetre, sulphur and lead as well as five or six guns (pixides) and many projectiles<sup>2</sup>. Part of the supplies were shipped to Olsztyn and Krzepice, which were besieged at that time. At a later stage of the campaign, the royal army took Brzeźnica, Wieluń, Toplin, Wieruszów, Kępno and Grabów. Only Bolesławiec and probably Ostrzeszów were left unsieged by the Polish army<sup>3</sup>. Archaeologists have

confirmed the use of artillery in these battles and the following fights. In the castle ruins at Bolesławiec, stone balls used as projectiles for bombards have been found. Two of them are identical in size and weight to the sixteen relics kept in Wieluń. During the archaeological and architectural works conducted at Bolesławiec, "some clear traces of irregularities in the structure of the castle masonry house walls and some remnants of a kind of earthen entrenchment made on the castle road were discovered." This entrenchment may have been the place from which projectiles were fired at the castle walls, whose nearest point was 46 metres away, while the castle house destroyed during the fight was between 72 and 90 metres away from the earthwork<sup>4</sup>. It may also be noted that the artillery positions at Novy Hrad-Kunratic Castle and Lichnici in 1420, at Karlštejn near Prague in 1422 and at Bechynì in 1428 were 150-500 metres away from the fortifications and the firing was effective<sup>5</sup>.

The preparations for another expedition started in 1392. The king demanded that the people of Kraków (Cracow) provide a bronze canon ("unam pixidem de cupro cum pede") as well as some gunpowder and other artillery accessories. In addition, they gave Michał, the gunner, an amount of saltpeter, sulphur and stocks of other materials worth 480 marks<sup>6</sup>. The campaign against Władysław Opolczyk was resumed at the end of

<sup>1</sup> Joannes de Czarnkōw, *Chronicon Polonorum*, ed. J. Szlachowski, [in:] "Monumenta Poloniae Historica", vol. II, Lwów 1872, p. 726: "Contigit autem priusquam civitas terrigenis luisset tradita, artificem Barthosii lapidem aereo de pixide in valvam civitatis jecisse, qui lapis duas clausuras valvae cum vehementia pertransiens, dominum Nicolaum plebanum de Bechovia in platea civitatis ex opposito valvae aspicientem contigit, qui cadens subito exspiravit".

<sup>2</sup> *Libri antiquissimi Civitatis Cracoviensis 1300-1400*, ed. F. Pickosiński, J. Szujski, part II, Cracoviae 1878, pp. 230, 297.

<sup>3</sup> *Ibidem*, p. 234; J. Laberscheck, *Wyprawa zbrojna króla Władysława Jagiełły na krakowsko-wileńską posiadłość księcia Władysława Opolczyka w 1391 r.*, [in:] *Společenstvo Polski středniowiecznej. Zbiór studiów*, ed. S. K. Kuczyński, vol. VI, Warszawa 1994, pp. 156-157.

<sup>4</sup> *Zamki środkowopolskie*, part II: *Bolesławiec nad Prosną*, ed. T. Poklewski, Wrocław 1982, pp. 38-39.

<sup>5</sup> J. Durdí k, *Husitské vojenství*, Praha 1953, pp. 73-78; *idem*, *Sztuka wojenna husytów*, Warszawa 1955, pp. 94-97.

<sup>6</sup> *Libri antiquissimi ...*, part II, pp. 236, 300, 302.

January or the beginning of February 1393. The Polish forces headed for Bolesławiec again, but despite the heavy gun shipped from Kraków, the attempted siege of the castle ended in failure<sup>7</sup>. Artillery was also used during another expedition made by royal forces to the lands belonging to Bolesław IV, Duke of Opole and Niemodlin, a nephew of Władysław Opolczyk. The fight for Strzelce Opolskie, among others, took place at the end of August 1393 and continued until October. Zbrożek, the king's gunner, was probably in charge of the artillery there<sup>8</sup>. Warfare was resumed in January 1394, but it is the expedition of 1396 led by Spytko of Melsztyn that is interesting in respect of siege artillery. This campaign ended in the seizure of Gorzów, Olesno and Lubliniec. The army also laid siege to Opole, where one large and two smaller guns (pixides) sent from Kraków were used<sup>9</sup>. However, the peace treaty signed did not mean the end of warfare as Bolesławiec was not taken until 1401, which was only after Władysław Opolczyk's death.

From these records, we can see that in the fourteenth century, siege artillery was present on the battlefield but we do not know how effective it was. What is more, although all written sources mention a gun called "pixis" made of iron or bronze, it is unclear exactly what kind of weapon it was.

Jan Długosz (Johannes Longinus, a Polish annalist and chronicler) records Władysław II Jagiełło's expedition of 1404 to Podole. This expedition was aimed to restore the ruler's authority in Kamieniec, which was controlled by the supporters of Duke Świdrygiełło. It is the first item on the list of incidents where firearms were used in the fifteenth century. On entering the city, heavy guns called "bombardis"<sup>10</sup> fired projectiles

at the castle. The damage caused by the firing made the crew capitulate.

The Great War with the Teutonic Order began when Teutonic forces invaded Dobrzyń district in August 1409. The army took Dobrzyń, Bobrowniki and Złotoria, using artillery. As a result of the Teutonic Knights' activities and victories, Władysław Jagiełło and his army arrived in Bydgoszcz on September 28<sup>th</sup> to lay siege to the castle and the city the following day. The king made use of artillery and one victim of the continuous firing, which lasted for seven days, was the Teutonic commander of Bydgoszcz Castle<sup>11</sup>. Firing from the big guns caused heavy losses among the defenders. There were also casualties among the attackers, because the city and the castle used artillery as well. Unfortunately, we do not know how numerous the king's artillery was and of what guns it was composed. Undoubtedly, it was effective enough, because the fortifications were badly damaged and after the fortress had been seized the king ordered the walls repaired<sup>12</sup>.

The truce called shortly after these events was a chance for both sides to make preparations for further warfare. The Polish war plan was devised in Brześć-upon-Bug on November 30<sup>th</sup> 1409. Unfortunately, Jan Długosz, the chronicler, was only interested in the idea of building a pontoon bridge, which according to him, had never been seen before. Other things, including firearms, are not mentioned in his records. It should be noted that Polish strategy was based on the idea of winning decisive battles by means of the cavalry. Consequently, the importance of artillery was minimized. Artillery was, however, to be used during sieges. According to Długosz, and other sources, the royal army was accompanied by artillery<sup>13</sup>. Regrettably, no source contains information about the number of guns used. However, by estimating the load of the pontoon bridge built, T. M. Nowak argues that the army wheeled 30 guns<sup>14</sup>.

<sup>7</sup> Ibidem, p. 244: "vectori Czindil ducenti pixidem ante Castrum Bolislawicz dedimus III mrc."; J. S p e r k a, *Z dziejów wojen Władysława Jagiełły z księciem opolskim Władysławem. Działania wojenne w latach 1393-1394*, [in:] *Cracovia – Polonia – Europa. Studia z dziejów średniowiecza ofiarowane Jerzemu Wyrozumskiemu w sześćdziesiątą piątą rocznicę urodzin i czterdziestolecie pracy naukowej*, Kraków 1995, pp. 313-314.

<sup>8</sup> *Rationes curiae Vladislai Jagellonis et Hedvigis regum Poloniae 1388-1420*, ed. F. Piekosiński, Cracoviae 1896, p. 163: "Item Sbrosoni pixidario ad Magnam Poloniam misso ad expeditionem".

<sup>9</sup> *Libri antiquissimi* ..., part II, p. 252.

<sup>10</sup> Ibidem, p. 261.

<sup>11</sup> J. D ł u g o s z, *Annales seu Cronicae incliti Regni Poloniae*, liber X et XI, Varsaviae 1997, p. 32: „ex quarum [bombardis] continua proieccione commendator et capitaneus castris fuit interfectus”.

<sup>12</sup> Ibidem, p. 33.

<sup>13</sup> Ibidem, pp. 63, 64, 66; *Cronica conflictus Vladislai regis Poloniae cum Cruciferis anno Christi 1410*, ed. Z. Celichowski, Poznań 1911, pp. 15-16.

<sup>14</sup> T. N o w a k, *Z dziejów techniki wojennej w dawnej Polsce*, Warszawa 1965, p. 153.



Shortly after the Battle of Grunwald, the allied forces headed for Malbork, which they reached on July 25<sup>th</sup>. The defence of the Teutonic capital was organized by Heinrich von Plauen, the commander of Świecie, who arrived at the castle with his reserve corps. The allied forces took the city on July 26<sup>th</sup> and the siege ring around Malbork Castle was closed. The troops taking part in the siege operation were reinforced with artillery and some of the large guns were the Teutonic cannons carried off at Grunwald. Thus it may be assumed that the artillery troops were well organized and the gunners were skilled and well trained. On July 26<sup>th</sup>, at night, King Jagiełło had the larger guns moved to the parish church in the city and opened fire at the southern part of the castle and the vicinity of Brama Szewska (Shoemakers' Gate). The firing did not, however, destroy the fortress wall, but it probably damaged part of Baszta Wróblowa (Sparrow Tower), guarding the passage through Szewska Brama, part of the drawbridge as well as Baszta Dytrykowa leading from the city to St Ann's Chapel at Wysoki Zamek (High Castle). In addition, after the siege, the Teutonic Knights repaired the walls and walks with gunloops between the flanking towers. The walls of St John's Church gave the gunners protection against projectiles fired from the Teutonic cannons standing on the wall of the counterscarp of the castle's moat less than 40 metres away from the Polish position<sup>15</sup>.

The remaining other guns were arranged in such a way that it was possible for the attackers to fire at the castle from all sides. Thus they were placed in the positions occupied by the Lithuanian forces, at the foot of the castle as well as on the right riverbank, near the bridge burnt by the defenders<sup>16</sup>.

<sup>15</sup> M. H a f t k a, *Zwischen Sage und Wahrheit. Aus der Geschichte der ersten Belagerung der Marienburg 1410*, [in:] *Marienburg. Das Schloss des Deutschen Ordens*, ed. M. Woźniak, Bydgoszcz-Malbork 1993, p. 101; M. K u c, *Obłężenie twierdzy malborskiej w 1410 roku – aspekty militarne*, "Zapiski Historyczne", vol. LXV, 2000, No. 1, pp. 38-39.

<sup>16</sup> J. D l u g o s z, *Annales ...*, liber X et XI, p. 132: "rex Wladislaus nocte eadem bombardis maioribus in ecclesiam opidi introductis continua percussione ex illis castrum quatit. Locate et alie bombarde fuere in exercitu Lithuanico, alie circa pomerium, alie in pede pontis ex altera parte Wisle exusti et ex omnibus illis quaciebatur castrum fortissime in quadrum".

The latter, placed at a distance of 200-250 metres, severely damaged the Grand Master's palace, St Laurence's Chapel and the granary at Niski Zamek (Law Castle). There were also guns on the eastern side. They were directed against Klesza Wieża (Priest Tower), which stood about 100-120 metres away from them and from St Ann's Chapel. The towers near Brama Snycerska (Woodcarver's Gate) may have been under fire too. According to the account written by the continuator of Posilge's chronicle, the allied forces' artillery caused bad damage to the fore part of the castle, near the gates and in other places<sup>17</sup>. The guns standing on the northern and north-eastern side fired at Maślankowa Baszta (Buttermilk Tower)<sup>18</sup>.

The artillery arrangement described above suggests that the attacker's basic aim was to block the street leading from the city gate to the castle and Baszta Wróblowa and to surround the besieged crew so that they were completely cut off. The attackers wanted to make sure that no reinforcements could reach the fortress. This is the basic principle of any siege operation and if successfully put into practice, has proved to be extremely effective from antiquity to modern times. However, it was very difficult for any army to take Malbork Castle by storm. What is more, the commanders of the allied forces were not prepared to conduct a large-scale siege operation because of the strategic aims of the whole campaign. It has been assumed that the siege operation carried out by the Polish and Lithuanian army were very repetitive in character and the only active element of the fight was the artillery firing at the castle<sup>19</sup>.

The firing was intensified during the following days when the king received new guns and more gunpowder ("buchsinn und pulver") from Elbląg and Toruń<sup>20</sup>. Projectiles fired from large

<sup>17</sup> J o h a n n v o n P o s i l g e, *Chronik des Landes Preussen (von 1360 an, fortgesetzt bis 1419) zugleich mit den auf Preussen bezüglichen Abschnitten aus der Chronik Detmar's von Lübeck*, [in:] "Scriptores rerum Prussicarum", vol. III, ed. E. Strchlke, Leipzig 1866, p. 320: "Und der koning [...] was her schadin tate mit buchsinn und blydin an dem vorburge, by den stellin und an den thornen".

<sup>18</sup> M. H a f t k a, op. cit., p. 102; M. K u c, op. cit., pp. 39-40.

<sup>19</sup> M. K u c, op. cit., pp. 37-38.

<sup>20</sup> J. P o s i l g e, op. cit., p. 320.

guns caused heavy damage, which had to be mended at high cost during the following years<sup>21</sup>. Baszta Wróblowa was destroyed and part of the wall, weakened by the firing, was demolished by the Teutonic Knights themselves (“murum Regis bombardis debilitatum ruinant”), who also damaged a couple of Polish guns during their raids<sup>22</sup>. The fact that such steps were taken in order to get rid of the enemy’s artillery means that the guns were a real problem for the besieged defenders.

However, the use of artillery during the siege of Malbork was quite ineffective. This was because the commanders of the allied forces had a different conception of conducting this military campaign, and had not taken into consideration the possibility of besieging Teutonic castles, where artillery could have played an important part. Although artillery damaged a few buildings at the castle, it was not decisive as far as the ultimate outcome of the battle was concerned<sup>23</sup>. The artillery was not powerful enough to make large holes in the walls of Malbork Castle, which would have facilitated taking the fortifications by storm.

During the so-called “hunger” war of 1414, the cannons must have been more numerous, because besieging castles was part of the strategy. The Polish army found it very difficult to cross the Vistula River at Zakroczym because of the high river level. A few largest guns and 300 men operating them were lost<sup>24</sup>. Due to the fact that Teutonic forces had fortified Drwęca River, the allied army headed for Nidzica and took the town. However, the siege of the castle lasted for seven days and artillery must have played a significant role in the operation. Artillery was also used at Lidzbark Warmiński, but despite a long

and intensive siege, the town was never seized. Attacks on the town of Brodnica were also a failure, which among other things, resulted in the Polish and Lithuanian forces’ retreat from the lands belonging to the Teutonic Order in 1414.

The conflict between Poland and the Teutonic Knights revived in 1422. On 1<sup>st</sup> August, the allied forces arrived at Lubawa. They made camp and awaited the provisions and artillery, as in order to move faster, the commanders had left the artillery in Brześć Kujawski. Thus when the siege was laid, the army had at their disposal only one large gun and the rest was shipped a few days later<sup>25</sup>. On 17<sup>th</sup> August, the army reached Golub and took the town without delay. In order to take the castle, the attackers used large guns and fired projectiles from siege machines. The fortress was taken after a three-day fight<sup>26</sup>. As soon as the battle of Golub was over, the allied forces left for Kowalewo, took the town, which had been burnt down by the Teutonic Knights, and attacked the castle. But despite intensive artillery firing<sup>27</sup> and a number of raids, the fortress was not seized, and a peace treaty was signed near Mielno Lake a few days later, on 27<sup>th</sup> September 1422.

After the death of Vytautas the Great, Duke of Lithuania, Władysław II Jagiełło made his brother Świdrygiełło ruler of Lithuania. However, the latter’s separatist tendencies and a conflict over Western Podole brought about a war with Poland. The Polish army gathered at Horodło on 20<sup>th</sup> July 1431. Artillery was shipped there from Kraków and probably from Lwów (Lvov). The forces surrounded the castle at Łuck on August 1<sup>st</sup>. However, artillery was not used until a few days later, when the bridge was rebuilt and large guns were then wheeled over it. The projectiles fired from the large demolition guns started to make big holes and thus damage the walls and a number of towers were knocked down too. Jagiełło was not happy to see the town demolished. He is even said to have insisted on ceasing the fire from

<sup>21</sup> S. K u j o t, *Rok 1410. Wojna*, “Roczniki Towarzystwa Naukowego w Toruniu”, vol. XVII, 1910, p. 228; K. G ó r s k i, *Dzieje Malborka*, II edition, Gdańsk 1973, p. 76.

<sup>22</sup> J. D l u g o s z, *Annales ...*, liber X et XI, p. 138.

<sup>23</sup> S. M. K u c z y ń s k i, *Wielka wojna z Zakonem krzyżackim w latach 1409-1411*. Warszawa 1966. pp. 440, 443; M. K u c, op. cit., p. 40.

<sup>24</sup> J. P o s i l g e, op. cit., p. 340: “Und als sy soldin obirdy Wysel zcin zcu Warschow offbruckin, dy sy dorobir hattin gemachit, do vortrunkin yn ere grostin buhsin und wol IIIc man, und ging yn nicht noch crim willin”; por. J. G o ̇ d z i c l e w s k i, *Wojna polsko-krzyżacka 1414 r., tzw. “wojna głodowa”*, “Studia i Materiały do Historii Wojskowości”, vol. XVI, part II, 1970, p. 37.

<sup>25</sup> S. E k d a h l, *Der Krieg zwischen dem Deutschen Orden und Polen-Litauen im Jahre 1422*, “Zeitschrift für Ostforschung”, Jg. 13, 1964, pp. 619-620.

<sup>26</sup> J. D l u g o s z, *Annales ...*, liber XI, Varsaviae 2000, p. 173: “arce[m [...]] in monte ediciori sitam obsidione vallat et bombardis maioribus fortissime illam quatit”.

<sup>27</sup> Ibidem, pp. 179-180.



large cannons<sup>28</sup>. The storming of the fortress took place on August 13<sup>th</sup> but the attackers failed to take the castle. The defenders, cheered by some chaos in the enemy ranks, fired projectiles from their guns, rifles, bows, arbalests and stone-throwing machines, which made the attackers retreat. A truce was signed, which lasted until 17<sup>th</sup> August. The defenders used the ceasefire to repair the damage caused by the firing and mend the fortifications. Then the Polish forces renewed artillery firing, but the defenders caused heavy losses as well by firing projectiles from their weapons placed on the towers and walls. The siege of Łuck was terminated by the news of an invasion of Dobrzyń district and the Kujawy region organized by the Teutonic Knights, allied with Świdrygiełło. On 3<sup>rd</sup> September, Władysław Jagiełło broke camp and retreated from the battlefield. The only notable event during the siege of Brześć Kujawski, was that the Teutonic commander was fatally wounded with an artillery projectile<sup>29</sup>.

In July 1431, the Polish levy-in-mass and Czech Hussite forces arrived at Chojnice in revenge for the Teutonic attack on northern Poland. They surrounded the town with earthworks, on which siege machines and guns were placed<sup>30</sup>. According to a Teutonic account, there were four large artillery guns (“III groze bochzen”) firing projectiles the size of a bucket (“grossze den eyne eymer”) <sup>31</sup>. One of the projectiles is known to have fallen in a church full of people saying their prayers<sup>32</sup>. However, neither the continuous firing nor drying up the moat brought about success. In addition, the defenders carried out a successful raid and spiked one of the four biggest Polish guns standing near St George’s Church<sup>33</sup>. The storming

of the fortifications of Chojnice which took place on 22<sup>nd</sup> July was unsuccessful and all the following raids ended in failure as well. Artillery firing was ineffective because the attackers did not have at their disposal large demolition guns<sup>34</sup>. Under the circumstances, after eight weeks of siege, the Polish and Hussite army left Chojnice and headed for Gdańsk via Tczew. They arrived in Gdańsk on 1<sup>st</sup> September. The artillery was positioned on Biskupia Górka (Bishop’s Hillock), and could not be reached by projectiles fired from the city. What is more, according to Długosz it was easy for the attackers to fire projectiles at the city from a hill<sup>35</sup>. However, four days had passed and there were no prospects for peace. This is why the attackers decided to break camp and raise the siege.

The events of 1433 ended the fifty-year period of using firearms and siege artillery in Poland. It was the time of experiments, tryouts and failures. However, it is thanks to state, mainly royal, municipal, church and private investment that firearms flourished in the following centuries.

The Thirteen Years War of 1454-1466 with the Teutonic Order was a great challenge for firearms, which were the most commonly used siege weapons at that time. In the light of surviving registers of firearms sent to the battlefield via Toruń, it may be assumed that the army needed pizschälen (12), harquebuses with hooks (19), harquebuses [Lotbüchsen] (38), terrace-guns (6), breech-loading cannons with a changeable chamber called “folgers” (6), troop-guns (11), as well as stone guns [Steinbüchsen] (40)<sup>36</sup>. Among the weapons there were only 63 large cannons. However, if we leave out the terrace-guns, folgers and troop-guns, which were non-siege weapons and could not be classified as such, there were only

<sup>28</sup> Ibidem, liber XI et XII, Varsaviae 2001, p. 31: “Bombarde quoque maiores castro admote, quaciebant et rumpebant murum et plures turres et spacium notabile muri disiecerant, Wladislao rege inprobante murorum concussionem et exhortante aliquos, ut a proiectione bombardarum abstinere tur”.

<sup>29</sup> Ibidem, p. 39: “uno ex comendatoribus ictu bombarde interfecto”.

<sup>30</sup> Ibidem, p. 89.

<sup>31</sup> *Die ältere Hochmeisterchronik*, [in:] “Scriptores rerum Prussicarum”, vol. III, ed. M. Toeppen, Leipzig 1866, p. 634.

<sup>32</sup> Ibidem: “Dornoch toten sy abir cynen andern schos yn dy pharrekerche, dorynne waz gros volk”.

<sup>33</sup> Ibidem: “Sy brochte III groze bochzen an III ende

der stadt an, sunder dy cynen yn sente Jurgen kirche, dy vorkeilte man yn”; zob. A. L e w i c k i, *Powstanie Świdrygiełły. Ustęp z dziejów unii Litwy z Koroną*, Kraków 1892, p. 189.

<sup>34</sup> J. M a c e k, *Husyci na Pomorzu i w Wielkopolsce*, Warszawa 1955, p. 72.

<sup>35</sup> J. D l u g o s z, *Annales ...*, liber XI et XII, p. 95: “ex monte in illam erat proieccio”.

<sup>36</sup> M. B i s k u p, *Wykaz broni palnej i innego sprzętu wojennego wysyłanego przez Toruń w okresie wojny trzy-nastoletniej (1454-1466)*, “Zapiski Historyczne”, vol. XXXI, No. 1, 1966, p. 83; idem, *Trzynastoletnia wojna z Zakonem Krzyżackim 1454-1466*, Warszawa 1967, p. 723.

40 stone guns, whose function remains unclear. Nonetheless, it should be pointed out that troop-guns did perform the function of siege artillery in the battle of Debrzno (1461), the battle of Świecie (1461), the battle of Chojnice (1466). Terrace-guns were used as siege artillery during the siege of Świecie (1461), folgers in the sieges of Malbork (1454), Świecie (1461), Nowe (1464, 1465) and Chojnice (1466)<sup>37</sup>.

To some extent, this assumption is further supported by the list of weapons kept at particular castles in Poland in the last quarter of the fifteenth century, as illustrated by the table below.

Kind of weapon	Brześć Kujawski	Ciżmiany	Gostynin	Kamieniec Podolski	Lwów	Łowicz	Przemysł	Skala	Smotrycz
Half terrace-guns	-	-	1	-	4	1	-	2	-
Terrace-guns	-	1	1	-	4	1	4	-	-
Half troop-guns	-	-	1	-	2	1	-	-	-
Troop-guns	-	1	-	-	-	1	-	-	-
Folgers	2	11	2	3	-	-	7	-	5
Serpentines	-	-	-	-	-	-	4	-	-
Mortars	-	-	-	-	1	-	5	3	-
Siege-pieces	-	-	-	5	-	-	4	-	-

Whatever kinds of weapon were used, artillery did not play a significant role in siege operations at that time and was not decisive as far as their outcome was concerned. Firearms performed a subsidiary function and a good blockade was still the most effective way to seize a place. It may only be noted that the guns used were not high quality weapons yet and that they were not effective enough to change the course of a battle. To sum up: It may be assumed that artillery could not bring about victory in the Thirteen Years War<sup>38</sup>. It had, however, been in use in Poland for only 80

years or so. In Italy, where the economy and technology were much more advanced, artillery had not advanced even over a dozen years later. Leonardo da Vinci offered his services connected with war technology to Ludwig Sforza, Duke of Milan, saying that if fire artillery failed, he would build all sorts of projectile throwing machines which could be used to both attack and defend a fortress<sup>39</sup>, his offer showing that he did not fully believe in the effectiveness of firearms.

During the two preceding periods, which might be referred to as pre-school and primary school stages, that is to say, in the years 1383-1433 and 1434-1466, Polish artillery participated in over 20 siege operations mentioned in written sources. Half of them ended in success and firearms substantially contributed to the victory. If one takes into consideration their technical parameters and tactical usefulness, one must come to the conclusion that they were quite effective.

The experience gained during the Thirteen Years War was not fully used in the following years. It could clearly be seen during the fights for the crowns of Hungary and Bohemia. The expeditions of 1471 organized in the name of the Jagiellon dukes to Hungary (Casimir) and Bohemia (Władysław) were unsuccessful. Both armies must have been accompanied by artillery, but its presence is only evidenced by the pay lists of the gunners taking part in the Czech expedition<sup>40</sup>.

Polish artillery did not play a significant part in the Silesian campaign of 1474 either. A large Polish and Czech army of Casimir and Władysław Jagiellon commanded by Jan Rytwiański stood at the foot of Wrocław from 28<sup>th</sup> October to the beginning of December. The forces stayed near the city for a month but a regular siege was never laid. This was a result of a lack of large guns, which had sunk while the army was crossing the Oder River<sup>41</sup>.

<sup>39</sup> T. Nowak, op. cit., pp. 36-37.

<sup>40</sup> K. Górski, *Historia artylerii polskiej*, ed. T. Korzon, Warszawa 1902, p. 217: Regestrum distributorum prefatorum florenorum pro stipendiariis cum Domino Vladislao rege Bohemie euntibus, per me Thomam Trompczyński ipis daturum de anno Domini 1471.

<sup>41</sup> P. Eschenloer, *Stadtschreibers zu Breslau. Geschichten der Stadt Breslau oder Denkwürdigkeiten seiner zeit von Jahre 1440 bis 1479*, ed. J. G. Kunisch, vol. II, Breslau 1828, p. 307; K. Buczkowski, *Walka Jagiellonów z Maciejem Korwinem o koronę czeską w latach 1471-1479*, Kraków 1980, p. 109.

<sup>37</sup> M. Biskup, *Trzynastoletnia wojna ...*, p. 724.

<sup>38</sup> Ibidem, pp. 725-726; idem, "Wojna pruska", czyli wojna Polski z zakonem krzyżackim z lat 1519-1521 u źródeł sekularyzacji Prus Krzyżackich część II, Olsztyn 1991, p. 41.



Smaller guns were ineffective as some of the Polish positions were a mile away from the city<sup>42</sup>.

Firearms seem to have been underestimated during the so-called "priest war" of 1467-1479. Lack of large guns was perceived as a disadvantage by Jan Biały of Sroczków, burgrave of Kraków, the son of Piotr Dunin of Prawkowice, who had become very famous thanks to his successes in the Thirteen Years War. Jan Biały did not lay siege to Olsztyn Castle and the castle in Lidzbark Warmiński. At the end of 1478, the two castles were well fortified and the commander did not run the risk of besieging them without artillery. The situation was similar in Pomezania, where firearms and 2 tons of gunpowder were shipped from Gdańsk to besieged Kwidzyń<sup>43</sup>. Lack of siege artillery and a small number of infantrymen was the main reason why the war dragged on and the most important centers of resistance belonging to Mikołaj Tungen, Bishop of Warmia were never seized<sup>44</sup>.

Therefore in Poland firearms were not underestimated, but the commanders failed to take full advantage of them. What is more, the military campaigns carried out at the end of the fifteenth century ended in failure and artillery did not prove effective. Duke Jan Olbracht's forces, which were to help him ascend the Hungarian throne, were also equipped with firearms. In the autumn of 1490, they opened fire at Koszyce, where the balls damaged a gothic cathedral<sup>45</sup>. The intensive and effective firing made the defenders enter into talks about the city's capitulation, but as Casimir Jagiellon stopped supporting the operation,

the siege lasted until the beginning of the following year.

Artillery failed to play a decisive part during the expedition of 1497 to Moldavia too. The siege of Suczawa ended in failure although King Jan Olbracht had many good guns, which were listed in a register of 1509. The list comprised 41 different guns, including siege-pieces, terrace-guns, caper-guns, and 194 mysterious "goats", mentioned in the text as "cozy" (goats), as well as 6 arquebuses with hooks<sup>46</sup>. However, 16 guns and 94 goats appeared in the Lwów arsenal as late as 1509. Nonetheless, there still remained a hundred goats, 10 screw-cannons, 6 troop-guns, 3 terrace-guns, 2 half screw-cannons, 2 caper-guns, one siege-piece and 1 half siege-piece, that is, 125 guns of various types<sup>47</sup>. Maciej of Miechów chronicled the participation of artillery in the expedition<sup>48</sup>. More valuable information can be found in the account written by Bernard Wapowski. According to it, Jan Olbracht left Kraków together with enlisted cavalry and infantry forces and he had at his disposal a number of large heavy guns and cannons. Bernard Wapowski says that numerous guns were used in the siege of Suczawa. The cannons must have been enormous as one of them had to be pulled by 40 horses and another by 50 animals<sup>49</sup>. The guns may have been the two siege-pieces, a demolition piece and a half demolition piece, listed in the record of 1509.

At Suczawa the artillery was positioned on the southern side, where there was the only road leading to the castle, standing on a high hill. The siege was laid on 24<sup>th</sup> September and it consisted in intensive artillery firing, which caused severe damage to the defensive wall. However, the holes made during the day were instantly repaired by night. The defenders used pieces of wood, mud and waste matter from animals to mend and

<sup>42</sup> P. E s c h e n l o c r, op. cit., p. 312; M. G o l i Ń s k i, *Działania wojenne a modernizacja systemów obronnych na Śląsku w drugiej połowie XV w.*, "Kwartalnik Architektury i Urbanistyki", vol. XL, No. 1, 1995, p. 55.

<sup>43</sup> M. P l e w c z y Ń s k i, *Wojna księcia na Warmii 1470-1479*. "Studia i Materiały do Historii Wojskowości", vol. XXXVIII, 1996, pp. 32, 33, 36.

<sup>44</sup> Ibidem, p. 40.

<sup>45</sup> *Kroniki Bernarda Wapowskiego z Radochonic. kantora katedr. krakowskiego część ostatnia czasu podługoszowskie obejmująca (1480-1535)*, [in:] "Scriptores rerum Polonicarum", vol. II, ed. J. Szujski, Kraków 1874, p. 9: "Albertus dux nec promissis nec minis ad dedicionem impellere potuit, cum arcta obsidione cingit, globis magnarum bombardarum muros quater ac cruce cepit"; M. B i e l s k i, *Kronika polska*, ed. K. J. Turowski, Sanok 1856, p. 884; sec: M. K r o m e r, *Mowa na pogrzebie Zygmunta I oraz O pochodzeniu i o dziejach Polaków księgi XXXI i XXX*, ed. J. Starnawski, Olsztyn 1982, p. 32.

<sup>46</sup> K. G ó r s k i, *Historia artylerji ...*, p. 220-222; F. P a p ć c, *Jan Olbracht*, II edition, Kraków 1999, pp. 127, 142.

<sup>47</sup> Por. A. B o r z e m s k i, *Sily zbrojne w wołoskiej wojnie Jana Olbrachta*, Lwów 1928, p. 37.

<sup>48</sup> M a c i e j z M i e c h o w a, *Chronica Polonorum*, Cracoviae 1521 [1986], p. 351: "Castrum Szoczaua [...] quod exer-citibus admotis oppugnabat, bombardisque quaciendum mandauit".

<sup>49</sup> *Kroniki Bernarda Wapowskiego ...*, p. 27: "Adhibite sunt huic oppugnacioni plurime bombarde, sed due precipue stupende magnitudinis, quarum una equis quadraginta, altera quinquaginta trahcbatur".

strengthen the fortifications. They also had at their disposal some cannons sent by *Gospodar* (Prince) Stephen from Transylvania<sup>50</sup>. Lack of spectacular success, a shortage of provisions and the possibility that Władysław Jagiełło and his Hungarian army would come to the city's rescue made the Polish forces abandon the siege on 19<sup>th</sup> October and retreat. Finally, on 26<sup>th</sup> October, they were defeated in a forest ravine near Koźmin.

The unsuccessful expedition to Moldavia resulted in Basha Bali Bey Malkoch-oglu of Silistria's invasion of Poland the following year. His army reached Lwów on 13<sup>th</sup> May 1498, but they did not lay siege to the city because of lack of large guns. Lwów had been preparing itself for the defence against the Turks for over a dozen years. The threat of a Turkish invasion brought about the city council's decision to demolish all buildings remaining within artillery range outside the fortifications so that in the case of an attack, the enemy could not take cover in them<sup>51</sup>. The very fact that the houses standing in the foreground of a permanent point of resistance were knocked down should not be surprising, because this had been done as early as the time of neuroballistic machines. The important thing is that the "safe" distance was measured by effective artillery range. The Turkish invasion discussed here caused panic even in the capital city. The people of Kraków started to seriously prepare for its defence. It was then that the well-known and widely admired Barbican was erected in front of Brama Floriańska (Florian's Gate).

Thus, during the following period and even at the beginning of the sixteenth century, artillery played a minor tactical role. Contemporary cannons were not rapid-fire weapons, they had a short range and their maneuverability was quite small.

At that time siege artillery comprised above all, cannons of large calibre firing balls weighing from 50 to 100 lbs<sup>52</sup> (20-40 kg). They were called demolition guns or siege-pieces. In the classification adopted in Europe in the sixteenth century,

such guns were referred to as *scharfen mätzen*. In her "Book of Fayttes of Arms and of Chyualrye" written in 1410, Christine de Pizan suggests that in a siege, the besiegers should use large guns, throwing projectiles weighing between 400 and 500 lbs<sup>53</sup> (160-200 kg).

Mortars were the most commonly used kind of weapon. An interesting piece of this type was mentioned in 1468. It was called "bombarda nova mörzil dicta"<sup>54</sup>. The term denoted a mortar with a short barrel (1.5-bore weapon in the extreme cases). It had a narrow bullet chamber and a wide muzzle part, called a trumpet. The weapon cast stone projectiles in a high-arched trajectory. Thus mortars were used to fire at objects situated behind a vertical structure, such as a defensive wall. Mortars, demimortars and small mortars were capable of hurling no more than 20 projectiles a day<sup>55</sup>.

In 1496 in Gostynin "pixides magne alias dzala"<sup>56</sup> (large guns) were used. We do not know, however, what sort of guns they were. In 1509 in Lwów, the army used "bombarda alias burzące działo" and "bombarda magna alias polburzące działo"<sup>57</sup> (large guns). These must have been short-barrelled weapons with broad muzzles and narrow gunpowder chambers. The proportion of the calibre to the barrel length was between 1:3 and 1:7. Guns whose gunpowder chamber was 2/5 of the muzzle diameter and a barrel three times longer were the most effective. A projectile weighed 1/10 of a ball, whose weight in proportion to the weight of the whole gun had changed from 1:20 to 1:50.

<sup>53</sup> Ph. Contamine, *La guerre au moyen âge*, Paris 1980, p. 263.

<sup>54</sup> P. Eschenloer, *Historia Wratislaviensis et que post mortem Ladislai sub electo Georgio de Podiebrat Bohemorum rege illi acciderant prospera et adversa*, ed. H. Markgraf, [in:] "Scriptores rerum Silesiacarum", vol. VII, Breslau 1872, p. 183.

<sup>55</sup> Z. Spierałski, *Kampania obertyńska 1531 roku*, Warszawa 1962, p. 44; *Zarys dziejów wojskowości polskiej do roku 1864*, vol. I: *Do roku 1864*, ed. J. Sikorski, Warszawa 1965, p. 312.

<sup>56</sup> Archiwum Główne Akt Dawnych w Warszawie (Central Archives of Old Acts in Warsaw), Archiwum Skarbu Koronnego (The Crown Treasure Archives), section 56, G1/I. k. 1; J. Szteyflo, *Rzemiosła metalowe wraz z uzbrojeniem*, [in:] *Historia kultury materialnej Polski w zarysie*, ed. W. Hensel, J. Pazdur, vol. II: *Od połowy XIII do XVI wieku*, ed. A. Rutkowska-Płachcińska, Wrocław 1978, p. 105.

<sup>57</sup> K. Górski, *Historia artylerii* .... p. 221.

<sup>50</sup> Maciej z Miechowa, op. cit., p. 351; M. Kromer, *Kronika polska*, Sanok 1857, pp. 1329-1330.

<sup>51</sup> D. Zubrzycki, *Kronika miasta Lwowa*, Lwów 1844, p. 128.

<sup>52</sup> M. Gradowski, Z. Żygulski Jr., *Słownik uzbrojenia historycznego*, Warszawa 2000, p. 109.



The above proportions were based on the assumption that a gun's striking force depended on the size of a projectile and the proper length of the barrel<sup>58</sup>. Cannons with smooth barrels fired lead balls in a flat trajectory and were thus capable of damaging walls from a short distance. This is why such siege-pieces were called wall-demolition guns. Cannons with a narrow chamber and a wide muzzle part, called a trumpet, threw stone balls in a high-arched trajectory<sup>59</sup>. In order to obtain greater and greater striking force, larger and larger projectiles were fired from longer and longer gun-barrels. As a result enormous cannons were built. Dulle Griete of Ghent was a 640 mm-bore gun. It was 5 metres long, weighed 16.4 tons and hurled stone projectiles weighing 340 kg. A 500 mm-bore gun from Świdnica called "Swine" ("Sau"), which was most probably cast in 1467 was also an amazing weapon. It weighed 8.5 tons and it had a range of 2667 steps<sup>60</sup>. A bombard brought to Chojnice in 1454 weighed about 40-50 *cetnars*, that is, 2.2-2.7 tons<sup>61</sup>. However, the long range of a gun was not accompanied with accuracy. The main disadvantage of such cannons was large dispersion caused by the spinning of the round projectiles around a casual axis<sup>62</sup>. The practice of building giant cannons was abandoned when cast iron projectiles were introduced. Barrels became lighter, but longer, thanks to which a projectile had a bigger initial velocity and a greater striking force.

In 1478, at Łowicz Castle there were 4 "bombarde tercia pars quarte"<sup>63</sup>. They may corre-

spond to the cannon described as "schöne Viertel-Buchse" which was carried on a cart sent from the city of Wrocław against Ziębica Duchy in 1467<sup>64</sup>. Such quarter cannons, besides demicannons, were kept in Wrocław in 1483. They fired projectiles weighing a quarter of a *cetnar* (= 34 pounds = 13.6 kilograms). They seem to be rightly considered the ancestors of the "kartaun"<sup>65</sup> (a siege piece of large calibre).

The terrace-gun has not been classified as siege artillery, because its very name suggests that it was used on fortifications. Veuglaires "folgers" (breech-loading cannons with a changeable chamber, "kammerbüchse"), screw-cannons and long-barrelled guns called serpentines or "serpens" also belong to this group. They were, however, frequently used as siege guns. For example, such cannons were used during an artillery attack on Gdańsk in November 1520<sup>66</sup>. Among light fortress guns there were shot-guns, which fired small stones or iron buck-shots at a short distance. They were used to defend gates. We will not discuss here troop-guns and caper-guns, small, light, manouevreable field pieces which were the ancestors of falconets<sup>67</sup>, many-barrelled "organ-pipes" ("orgelgeschütze" or "orgelpfeifen") and goats, which could be classified as either large harquebuses with hooks or as small cannons but did not belong to siege-pieces either.

The range of medieval guns was not impressive. Contemporary cannons had a range of 1700 metres maximum and the record was about 2000 metres. The best large heavy guns had a range of 500 metres, while troop-guns and terrace-guns were capable of firing projectiles at a distance of 250-300 metres. They were not rapid-firing weapons either. Loading a gun took a very long time and there were some other technological obstacles, which made it impossible for the gunners to fire projectiles quickly.

<sup>58</sup> Ibidem, p. 24.

<sup>59</sup> Z. Żygułski Jr., *Broń w dawnej Polsce na tle uzbrojenia Europy i Bliskiego Wschodu*, II edition, Warszawa 1982, p. 122.

<sup>60</sup> D. G o c t z, *Die Anfänge der Artillerie*, Berlin 1985, p. 48; M. G o l i ń s k i, *Broń palna na Śląsku do lat trzydziestych XV w. oraz jej zastosowanie przy obronie i zdobywaniu twierdz*. "Studia i Materiały do Historii Wojskowości", vol. XXXI, 1988 (1989), p. 14; idem, *Działania wojenne ...*, p. 53.

<sup>61</sup> *Annales Glogovienses bis z. J. 1493. Nebst urkundlichen Beilagen*, ed. H. Markgraf, [in:] "Scriptores rerum Sillesiacarum", Breslau 1877, vol. X, p. 77, No. 6: "die bochse ist als von 40 ader 50 centener".

<sup>62</sup> M. W i c l i c z k o - W i c l i c k i, *Rozwój gładkich luf działowych*. "Broń i Barwa", vol. IV, 1937, No. 9, p. 195.

<sup>63</sup> *Acta capitulorum nec non iudiciorum ecclesiarum selecta*, ed. B. Ulanowski, vol. I: *Acta capitulorum Gneznensis, Poznaniensis et Vladislaviensis (1408-1530)*, Cracoviae 1902, No. 2173.

<sup>64</sup> M. G o l i ń s k i, *Działania wojenne ...*, p. 52.

<sup>65</sup> Idem, *Uzbrojenie mieszczańskie na Śląsku od połowy XVI do końca XV w.*, "Studia i Materiały do Historii Wojskowości", vol. XXXIII, 1990, p. 34.

<sup>66</sup> *Die Ferber-Chronik von 1511-1525*, ed. Th. Hirsch, [in:] "Scriptores rerum Prussicarum", Leipzig 1874, vol. V, pp. 531-532: "dupelte und enckel serpentiner".

<sup>67</sup> L. K r í ž e k, Z. J. K. C e c h, *Encyklopedie zbrani a zbroje*, Praha 1999, p. 82.

The increasing role played by artillery in seizing permanent points of resistance was reflected in the changes observed in military architecture around the turn of the fourteenth century. The process of adjusting fortifications to the new conditions resulting from the need to defend a place against firearms took place in Poland in the time of Władysław II Jagiełło, who had the fortifications of Wawel Castle modernized. Soon modern fortifications were constructed at a number of royal castles and cities in Great Poland, the Kujawy region, in Łęczyca and Sieradz districts.

These alterations in defensive architecture consisted mainly in lowering flanking towers in the outer walls to the height of the rampart, which led to the development of the artillery tower equipped with two-storey gunloops, where guns were positioned both at the top and in the dungeon of the structure. Owing to the fact that they protruded from the wall line, the fire from an artillery tower covered a wider field both in front of and along the wall. As a result the dead field was eliminated. Gates, which had been the weakest points in the fortification line, were also strengthened by adding new structures. A well-developed

protection of this kind was the barbican. It was a multi-storey, round or oval building with gunloops on each floor for allowing the use of firearms, particularly cannons. The firing covered the whole foreground. The artillery tower system became common in Poland at the end of the fifteenth century.

The new fortification solutions introduced at castles made the attackers build earthen, fascine or wooden artillery towers, where firearms were placed at a safe distance from the besieged fortification. This system proved very effective during the sieges of a number of fortresses in the Thirteen Years War of 1454-1466 (Malbork, Gniew, Chojnice). This technique was not a novelty in siege operations, because the method of besieging and fencing a place had been known and employed before. It was only adjusted to the new conditions which appeared on the battlefield as a result of the introduction of firearms. These changes created the need to train skilled auxiliary services, sappers, who would build artillery positions, organize water obstacles crossings and transport.

*Translated by Zuzanna Poklewska-Parra*

