

Jakub Niebylski¹

THE REMAINS OF THE “BATTLE OF KRAKÓW”, FOUGHT DURING WORLD WAR I, AS EXEMPLIFIED BY SITE SADOWIE-KIELNIK 1, KRAKÓW DISTRICT

ABSTRACT

Niebylski J. 2020. The remains of the “Battle of Kraków”, fought during World War I, as exemplified by site Sadowie-Kielnik 1, Kraków district. *Sprawozdania Archeologiczne* 72/2, 555-584.

This article presents the archaeological remains of World War I that were discovered in 2016 at the multicultural site Sadowie-Kielnik 1, Kraków district. The fights that broke out there were part of the Battle of Kraków, which took place between November 16-25, 1914. The parties to the conflict were the armies of the Austro-Hungarian Monarchy and the Russian Empire. The consequence of this battle was the halting of the attack of the Russian Army towards the west, which resulted in pushing them out of Galicia. A collection of 145 artefacts related to both armies was analysed. Additionally, archaeological features – field fortifications – were interpreted as well. This helped to explain their strategic function and to determine which of the two armies built them. It was also possible to determine the date of their construction and the time during which these fortifications were occupied by the army.

Keywords: conflict archaeology, Kraków Fortress, Lesser Poland, military equipment and armaments, World War I

Received: 06.03.2020; Revised: 17.04.2020; Accepted: 09.05.2020

¹ Institute of Archaeology and Ethnology, Polish Academy of Sciences, Sławkowska 17, 31-016 Kraków, Poland; jakub.m.niebylski@gmail.com; <https://orcid.org/0000-0002-6507-6087>

INTRODUCTION

The multicultural site Sadowie-Kielnik 1, Kocmyrzów-Luborzyca commune, Kraków district, has been known to researchers since 1987. It was discovered during the research project known as the Polish Archaeological Record (Polish name: Archeologiczne Zdjęcie Polski – AZP), and archived on the Archaeological Site Record Sheet (Polish abbreviation: KEZA) of AZP region number 100-57 (Niedziółka 2016, 122-125). The site is located on the Western Lesser Poland Loess Upland, in the convergence of two streams – the Pokojówka (formerly known as Goszcza – the right-bank tributary of the Szreniawa river), and the Sterkowiec (its right-bank tributary). The site covers part of a plateau of 32.5 ha, where many artefacts dated to the Neolithic (the Baden and the Lengyel cultures), as well as the Bronze (the Trzciniec culture) and the late Middle Ages, have been found (Fig. 1).

In 2016, excavations were conducted at this site in connection with the construction of the S7 expressway. Among other things, this resulted in the archaeological discovery of some military features in the form of a trench and a dugout. In charge of the field work in this section was Tomasz Fudali, MA. During the excavations in Sadowie, a fortified settlement of the Mierzanowice culture was discovered, which covered an area of over 5 ha (Przybyła *et al.* 2019, 332).

The defensive qualities and strategic location of the high plateau were used during World War I. This area, as a matter of fact, constituted a theatre of military operations of the Austro-Hungarian Monarchy and the Russian Empire. The distance from the site to the nearest Fortified Area of the Kraków Fortress is about 10 km.



Fig. 1. Sadowie-Kielnik, Kocmyrzów-Luborzyca commune, site 1. Location of feature 135 (dugout).
Modified by J. Niebylski

THE COURSE OF MILITARY OPERATIONS ON THE DISCUSSED TERRITORY DURING WORLD WAR I

The military operations took place in this area in November 1914, and were related to the so-called ‘steamroller’ of the Russian forces, attacking from the east. The commander-in-chief of the Russian Army, Grand Duke Nicholas Nikolaevich of Russia, sought to break the front between Radomsko and the Nida, to establish control in the Kraków Fortress and Silesia – and, as a consequence, to conquer the Czech territory and open the way to Berlin. The weakened Austro-Hungarian troops, in 59 divisions, withdrew to the west. Opposite the Austro-Hungarian Army and the army of the German Empire in the north, the army of the Russian Empire stood – in 95 divisions. The territories north, north-east and east of the city of Kraków were occupied by part of the 9th Russian Army, under the command of General of the Infantry Platon Alekseevich Lechitsky. His forces consisted of 13.5 divisions of infantry and three divisions of cavalry. Opposing them was the 4th Austro-Hungarian Army under the command of the infantry general, Archduke Joseph Ferdinand (Bator 2005, 102; Dąbrowski 2015, 118).

On November 14, 1914, the Russian Army launched an offensive aimed at capturing the Kraków Fortress. The chief of the General Staff of the Austro-Hungarian Army, Field

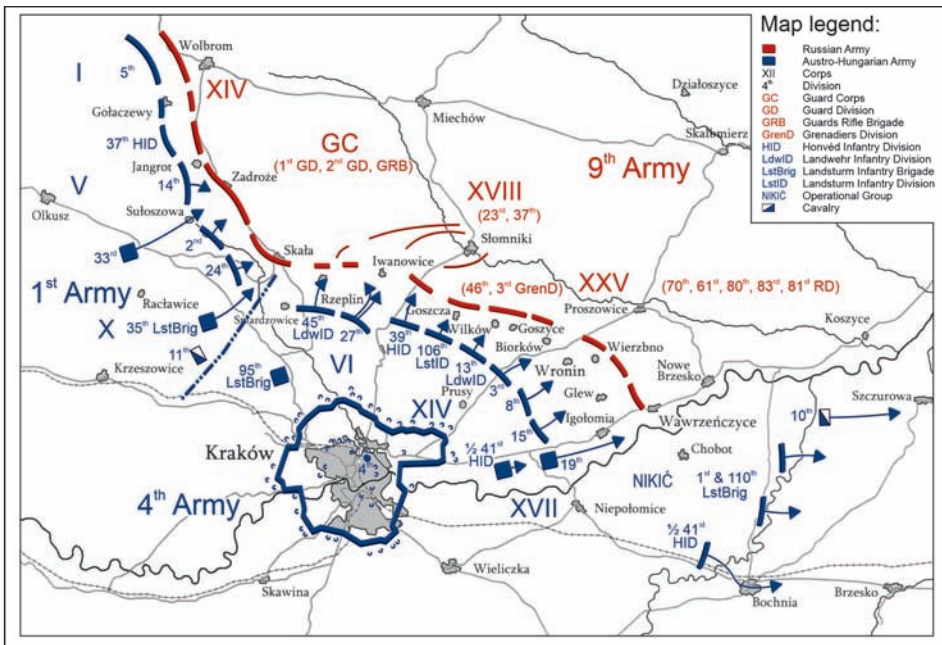


Fig. 2. Deployment of troops from November 16-18, 1914, in the Kraków area. After Orman and Orman 2015, modified by K. Grzyb and J. Niebylski

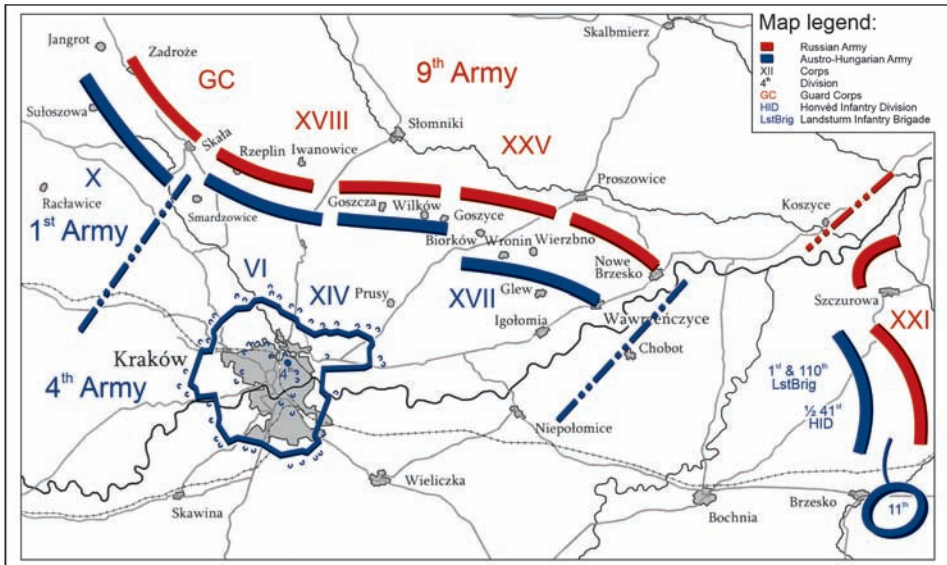


Fig. 3. Deployment of troops on November 19, 1914, in the Kraków area.
 After Orman and Orman 2015, modified by K. Grzyb and J. Niebylski

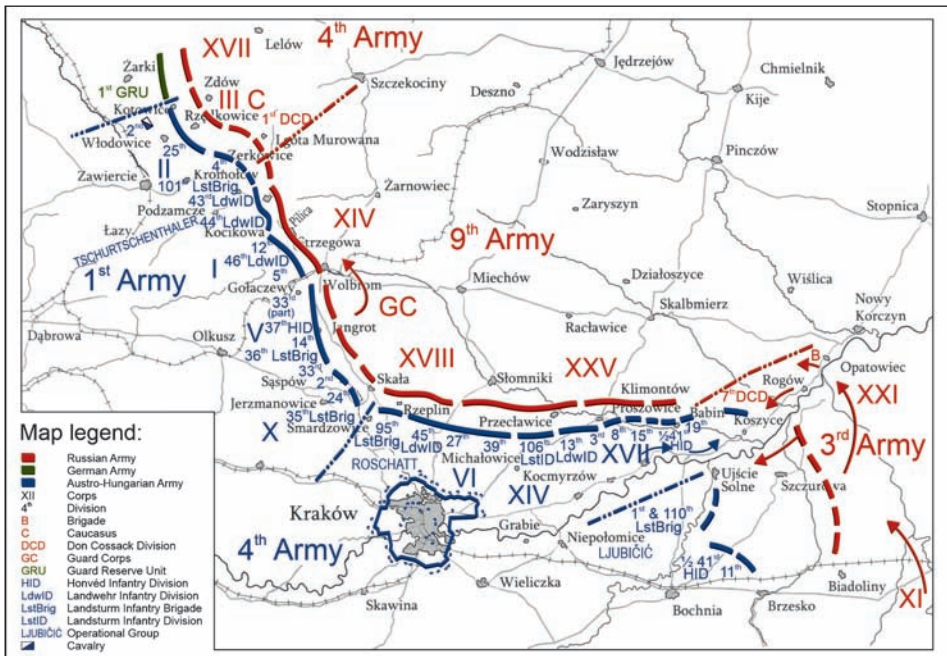


Fig. 4. Deployment of troops on November 22, 1914, in the Kraków area.
 After Orman and Orman 2015, modified by K. Grzyb and J. Niebylski

Marshal Franz Conrad von Hötzendorf, developed a plan called “Operation Kraków”, consisting in a pre-emptive strike near Kraków. This happened only on November 16 after the regrouping of troops, *i.e.*, two days after the Russians had launched their offensive at this section (Fig. 2). At that time, the Russian Army was successfully prevented from advancing any further by the artillery of the fortress on the Smardzowice-Wierzbno-Wawrzeńczyce line. The Austro-Hungarian Army also effectively drove the enemy out of their positions. On November 17, the units of the 39th Honvéd Infantry Division and the 27th Infantry Division reached the town of Goszcza after all-day battles (Niebylski 2020, 255; Orman and Orman 2015, 774, 778-779).

On November 18, 1914, the 39th Honvéd Infantry Division took part in heavy fighting northwest of the town of Goszcza, after which this division was stopped by the Russian Army (Horstenau 1932, 530). That day two forces merged: the XIV Corps under the command of Lieutenant-General Josef Roth and the group of Colonel General Karl Křitek, transferred to this operational region from the right bank of the Vistula. On November 19, 1914, the forces of the XIV Corps under the command of Lieutenant-General Josef Roth forced the attacking XVIII Corps of Russians to retreat toward the towns of Prusy and Goszcza; and, after the support of these operations by the group of Colonel General Karl Křitek, the front was moved towards the Szreniawa river (Fig. 3). That day, the 39th Honvéd Infantry Division suffered heavy losses (Niebylski 2020, 259; Orman and Orman 2015, 306).

The site of Sadowie-Kielnik 1, which is where the 27th Infantry Division and 39th Honvéd Infantry Division were fighting, is located about 1 km to the south-west of the town of Goszcza. The XIV Corps consisted of the 3rd and 8th Infantry Divisions and the 13th Schützen Division. That day, south of the Sadowie-Kielnik site, part of the XIV Corps, namely, the 106th Landwehr Infantry Division, were present; its left wing was protected by the 39th Honvéd Infantry Division, and further west by the 27th Infantry Division, grouped under the VI Corps. The Křitek group consisted of the 15th and 19th Infantry Divisions, the 96th Infantry Brigade and half of the 41st Honvéd Infantry Division. Opposite them, as part of the 9th Army of the Russian Empire at the section Wolbrom – Goszyce, the Guard Corps was stationed, along with the XXV Corps at the section Goszcza – Słomniki and the XVIII Corps from the town of Skąła to the town of Słomniki (Niebylski 2020, 257-258; Orman and Orman 2015, 778-779).

On November 20, 1914, at 3:30 p.m., the Russian Army opened artillery fire at Fort 49 “Krzesławice” from hill 279, between the villages of Prusy and Łuczanowice (currently part of Kraków), which was only 2 km away from the fort. The light artillery battery, which did not cause significant damage, had at least 20 guns. Counterattacks were carried out by the defenders of the forts in the strength of 18 battalions and were assisted by 114 guns. As a result, they managed to seize the Russian cannons together with their caissons. That day, the Austro-Hungarian VI Corps continued to carry out offensive operations in the area of Goszcza. It was the last day of fighting in this area (Horstenau 1932, 54; Orman and Orman 2015, 341).

Among the consequences of the military operations in this area were great personal losses for both sides. In the Kocmyrzów-Luborzyca commune, 1599 soldiers were buried, in addition to five mass graves with unspecified numbers of deceased soldiers. As a result of the entire Kraków operation, 70,000 soldiers of the Austro-Hungarian Army were eliminated from further combat (Bator 2005, 113; Pałosz 2012, 340-348, 353).

Austro-Hungarian soldiers took many prisoners during the fighting in this area. Between November 18-19 alone, their number was 3,000. The wounded were transported to Kraków's hospitals by train. In total, after a counter-offensive near Kraków, 28,000 Russian soldiers were taken as prisoners of war (Bator 2005, 104-106, 108-109, 111-113).

The effect of military operations at this section of the front was a shift of its line, formerly lying on the Prądnik-Białucha-Wisła rivers, northwards to the Dłubnia-Szreniawa line (Fig. 4). Between December 2-6, 1914, the second assault on Kraków took place – this time from the opposite, southern side. The retreating Russian Army headed south-east, where the Austro-Hungarian Army won the key battle of Limanowa as part of the Łapanów-Limanowa operation. In the wake of the military successes of the Austro-Hungarian Army, the front moved east, eventually pushing the Russian troops out of Galicia (Bator 2005, 112-115).

FIELD FORTIFICATIONS – ARCHAEOLOGICAL FEATURES

At site 1 in Sadowie-Kielnik, a dugout, oriented along an EW axis (feature 135), was discovered, along with a trench with niches, running from the dugout towards the east (feature 133). It was connected to another trench, oriented on a NS axis (feature 133 and feature 147, probably continuing as feature 265). About 50 m east of it, there was a parallel trench (feature 148); and, similarly, 20 m to the west, there was another parallel trench (feature 275). Seventy meters east of feature 148, there was another parallel trench (feature 112); while, 60 m east of feature 112 was the next line (feature 96 and 107).

Inside the dugout, in its northeastern part, there was a brick stove (feature 134). Ten meters north of the north-east corner of the dugout, there was a single elongated object oriented on a NW-SE axis (feature 146). Therefore, five trench lines with similar spacing were captured, which were probably connected to each other with communication trenches that were situated beyond the excavated area, enabling the assault columns to reach the first line and to provide the necessary supplies and ammunition (Fig. 5).

In several cases, it is possible to determine the function of the features. Feature 148, within the boundaries of the construction site, ends with a firing position (feature 262) in the south, with a branch to the east, extending at a right angle to feature 148, probably acting as a shooting trench with a fire line towards the south. In its southern wall, a niche was made, serving as a convenient observation and shooting point. Feature 146 is a one-man prone foxhole, whose south-eastern part has two berms, allowing fire in this direction (Fig. 6).

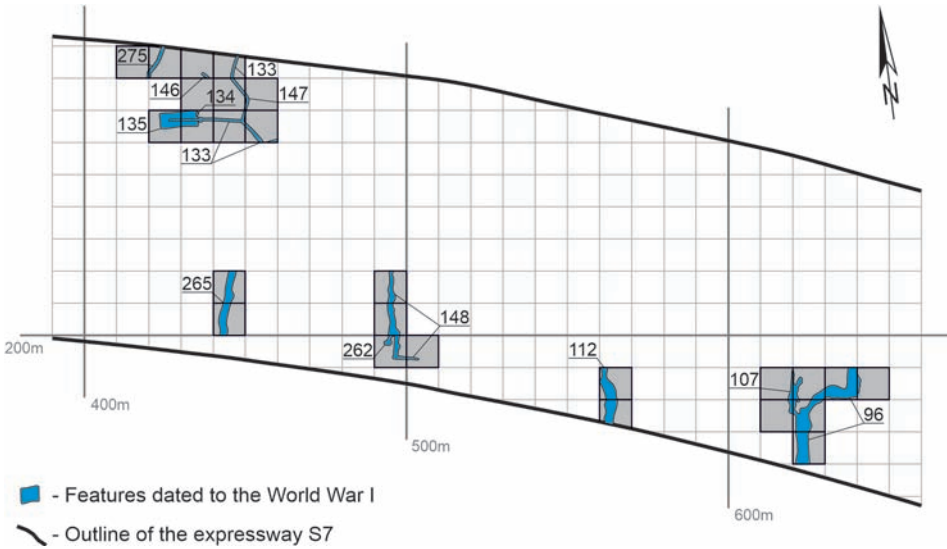


Fig. 5. Sadowie-Kielnik, Kocmyrzów-Luborzyca commune, site 1. Location of field fortifications related to World War I. Modified by K. Grzyb

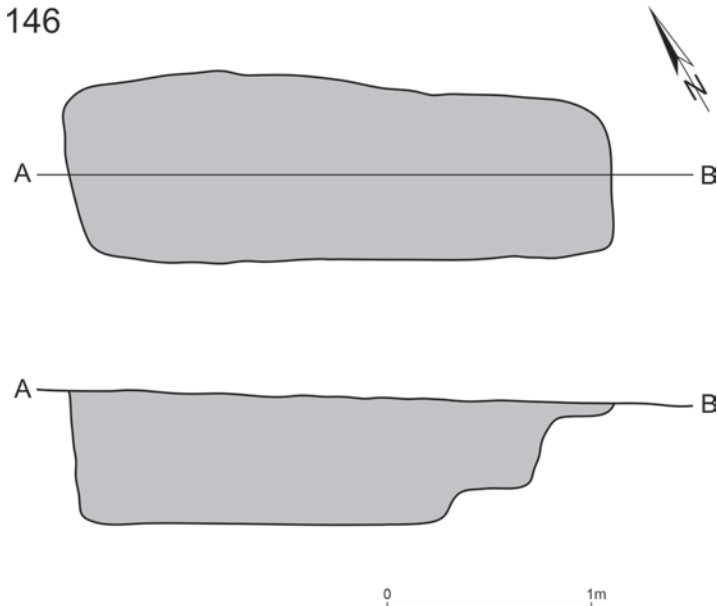


Fig. 6. Sadowie-Kielnik, Kocmyrzów-Luborzyca commune, site 1, feature 146 – plan and cross-section. Modified by K. Rosińska-Balik

The trench (feature 265) also has two berms formed on its eastern wall. The soldier standing at the bottom of the trench should be completely shielded from the direct fire of the enemy. The lower berm served as an elevated 'step' so that soldiers could maintain fire from it or observe the field, as well as rest. The upper berm, on the other hand, was a shelf for ammunition, equipment, weapon support, or sometimes an elbow support for soldiers taking a position with a rifle.

The dugout had a social function, as demonstrated by the presence of the stove. The trench reaching the interior of the dugout (feature 133) continues in the middle of it and has two berms in its southern wall. It can be assumed that it was possible to fire from the inside towards the south. The trench coming out of the dugout had two opposing niches for easier movement – it was a place for soldiers to pass each other (Fig. 7).

Considering the above, the examined field fortification line was built to conduct operations in the eastern direction, while the features oriented perpendicularly to the main lines allowed soldiers to direct fire toward the southern direction. It is possible that the captured features form the southern, flanking part of the layout. The course of the shooting

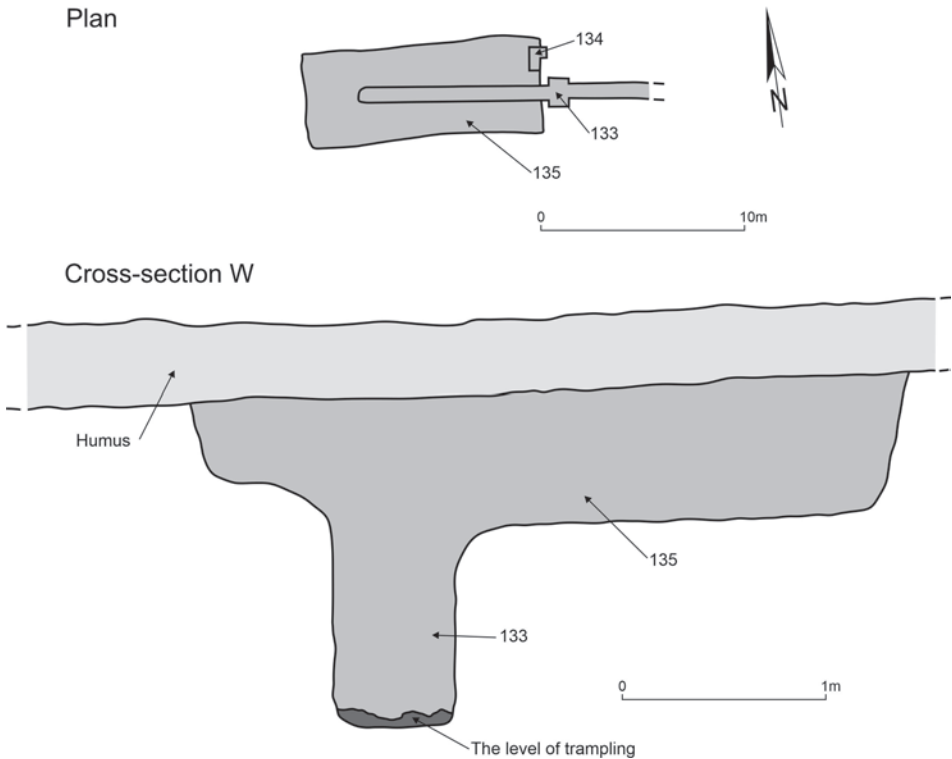


Fig. 7. Sadowie-Kielnik, Kocmyrzów-Luborzyca commune, site 1, features 133, 134 and 135 – plan and cross-section W. Modified by K. Rosińska-Balik

trenches was not planned in accordance with Austro-Hungarian regulations. They do not have characteristic perpendicularly-running 'promontories' situated every couple of meters from each other, with the trench going around them, at the back. They were built in Austro-Hungarian field fortifications for protective reasons – to limit the spread of debris and the percussion wave of exploding missiles and grenades. The 'promontories' were also used to limit the distance of fire in the trench – if the enemy got inside. The course of the trench line at this site forms a chain of 'broken' segments, rather than a straight line, which indicates the Russian school of engineering.

The distance between the parallel lines of the trench had been planned in such a way that it would not be possible to effectively throw a grenade at such a distance – since the range of an accurate throw is, on average, about 30 m. Leaving such a distance on the interfield also facilitates – if the line is occupied by the enemy – artillery operations, which need at least 150 m of field. Artillery shelling could cover both the interfield, the firing trench occupied by the enemy, as well as their base. Once craters formed after explosions of artillery grenades, it was possible to connect them with trenches, and in this way make positions for carrying out sorties. Additionally, explosions would destroy wire entanglements, facilitating the movement of soldiers to recapture lost trenches (Elterlein 2016, 17).

The depth of the features at the site varied. Their outlines were only clear at a depth of about 0.5 m due to intensive ploughing of the arable fields there. The one-man prone fox-hole (feature 146) of about 2.7 m in length, was 1.1 m deep from the ground level, while the trench (feature 133) was 1 m wide and about 2.1 m deep. At its bottom, the level of trampling was determined, and some pieces of wood were found, which were probably the remains of platforms or of a structure protecting its walls. Also, its continuation (feature 265) was characterized by a depth of approximately 1.9 m. The trench (feature 148) was 1.1 m deep, while the shooting trench with a niche located at a right angle to it was 3 m deep. Another line of trenches running towards the east was more than 1.3 m deep, while another one, also directed towards the east had a depth of 1.8 m. The dugout (feature 135) was 12 m long, 5.2 m wide, and 1.2 m deep. The roofing must have been a wooden structure clearly elevated above the ground level. The lower berms of the features were at depths of 0.8-1.4 m. In places, the floors of the features were shallower. It should be taken into account that the depth of these features did not give soldiers complete vertical protection. The soil removed while they were being dug out was mainly deposited for the breastwork, and a smaller amount was used for the rear part of the ditch. The dugout, however, was probably constructed all the way round.

The brick stove (feature 134) was constructed of bricks that might have come from the surrounding buildings, as well as sun-dried bricks made on site. It was located on the inside of the eastern wall of the dugout, about 0.5 m from the northeast corner. The horizontal projection was rectangular, 0.95 × 0.6 m, with access from the south. The fire chamber consisted of a single row of bricks arranged using the stretcher bonding. Inside the stove, at its eastern wall, a brick chimney, 0.4 × 0.4 m, was built, which was located in a niche in

134

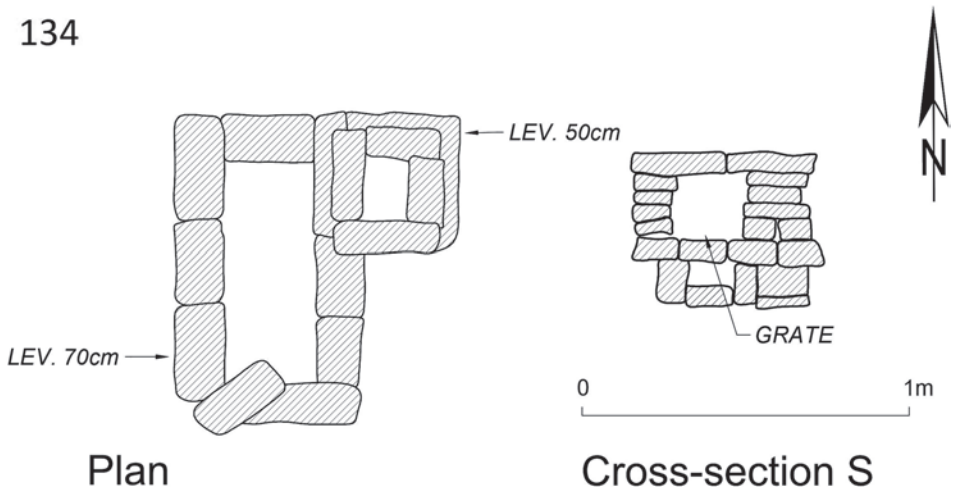


Fig. 8. Sadowie-Kielnik, Kocmyrzów-Luborzyca commune, site 1, feature 134 (brick stove) – plan and cross-section S. Modified by K. Rosińska-Balik

the wall, and as a result, the chimney did not need to be built through the roof of the dug-out itself. In the central part of the stove, there was a chamber with a cross-section of 0.3×0.3 m and a depth of 0.7 m. It connected vertically with the ash pan located below. The chamber was separated from the ash pan by a grate made of four rifles without stocks, put close together, with their barrels directed to the outside of the stove. The muzzles of the rifle barrels touched. They were all stacked up with their iron sights directed upwards, except the one on the far right, which was slightly rotated outwards. From the left they were as follows: a Mannlicher M1895, a Steyr M1912, a modernized, model 1 Mosin M1891, and a Mannlicher M1895. The barrels of the two middle rifles were slightly bent downwards about 25-30 cm from the muzzle of the barrel, while the barrel of the far right rifle was bent towards the remaining rifles, so as not to leave any free space, because the metal part of the rifle on the side of the stock (with the receiver and cartridge chamber) is much wider than the barrel (Figs 8-10).

CLASSIFICATION AND INTERPRETATION OF THE FINDS

During the archaeological research, 145 artefacts related to features 133, 134 and 135 were found. Some of them, of which there were 205 in total, were only in fragments. The finds can be divided into four categories:

1. Personal items of soldiers
2. Elements of uniforms and military equipment



Fig. 9. Sadowie-Kielnik, Kocmyrzów-Luborzycza commune, site 1. View of the brick stove from the south (feature 134). Photo by T. Fudali



Fig. 10. Sadowie-Kielnik, Kocmyrzów-Luborzycza commune, site 1. View of the partially dismantled brick stove from the west (feature 134). Photo by T. Fudali

3. Weapons, small arms and artillery ammunition
4. Elements and equipment of field fortifications

1. Personal items of soldiers

This group includes such artefacts as a safety pin and three coins (Fig. 11).

The safety pin has a single-coil spring about 0.5 cm in diameter. Its length is about 4.2 cm. It shows signs of repair by a soldier, who bent the end of the pin after part of the clasp had broken off. It represents the type patented by Walter Hunt on April 10, 1849. It was most likely used to fasten civilian clothes under uniforms (*e.g.*, sleeveless vests), or possibly to repair uniforms (*e.g.*, to fasten the lapels of a uniform below the neck if the hook in the hook-and-eye tore off).

Regarding the Russian coins, there are two specimens, each of which is worth 1 kopeck. In the case of the first coin, the complete year of issue is not legible, while the second one was minted in 1911. The Austro-Hungarian coin, worth 10 hellers, dates from 1895.

2. Elements of uniforms and military equipment

This group consists of uniform buttons, which belonged to soldiers on both sides of the conflict, along with two army buckles, hooks, elements of ammunition knapsacks, and a pan from a mess kit (Fig. 12-13).

The first of the three uncovered buttons was intended for a uniform of M1908 provenance of the Austro-Hungarian Monarchy. It is made of brass. The surface of the obverse is smooth, convex and has a rim curled towards the reverse. The diameter is 2.1 cm. Its shank was broken off (*Adjustierungsvorschrift...* 1911, 47; Schall 2014, 64). The second button, M1857, comes from a Russian uniform. Its diameter is 2.2 cm. The obverse is arched with an image of an eagle (*Sbornik...* 1915, 559-560). Its shank was bent and broken. The third button also represents M1857. Inside, there was an incompletely preserved reference number: (12) – ... (6) – C. П. Б. (S. P. B.). It has no shank, which would explain its presence on the site – like the other two, it must have been lost by its owner.

Two single-pin buckles with a movable bar made of steel were also found at the site. These buckles are typical of the Austro-Hungarian Army and used in many pieces of military equipment; they were originally painted black. The size of the rectangular frame, which is round in cross-section (and about 0.4 cm in diameter), is 2.8 × 2.3 cm (Schall 2014, 303). One of the buckles has no pin.

Parts of two ammunition knapsacks, M1888, of Austro-Hungarian provenance were also found (*Adjustierungsvorschrift...* 1911, 86-87; Hinterstoisser *et al.* 2006, 244-245; Ortner and Hinterstoisser 2013, 97-100). The first specimen was a lower, steel fitting attached to the edge of a knapsack, approximately 26 cm long, with a preserved portion of the left clasp, which was used to fasten the strap round the hips. The rivets to fasten it to the knapsack are made of copper. The fitting is bent in two places on the left, perhaps from heavy use. The adjustable hip-strap buckle, along with a fragment of steel wire protecting



Fig. 11. Personal items of soldiers. 1 – safety pin; 2-3 – Russian 1 kopeck coins; 4 – Austro-Hungarian 10 hellers coin. Photo by K. Grzyb, modified by K. Rosińska-Balik



Fig. 12. Elements of uniforms and military equipment. 1 – Austro-Hungarian button for an M1908 uniform; 2-3 – Russian M1857 buttons for a uniform; 4-5 – Austro-Hungarian single-pin buckles for equipment; 6-7 – Austro-Hungarian fittings for equipment. Photo by K. Grzyb, modified by K. Rosińska-Balik

it against spontaneous unscrewing, is preserved. The second fitting is of the same type and comes from a different ammunition knapsack. It has no adjustable buckle, but it is also bent outward on the left, probably also from use. An ammunition knapsack of this type could hold 80 rifle cartridges.

The pan from a steel Austro-Hungarian infantry mess kit, M1904, was found (*Adjustierungsvorschrift...* 1911, 89; Hinterstoisser *et al.* 2006, 250; Ortner and Hinterstoisser

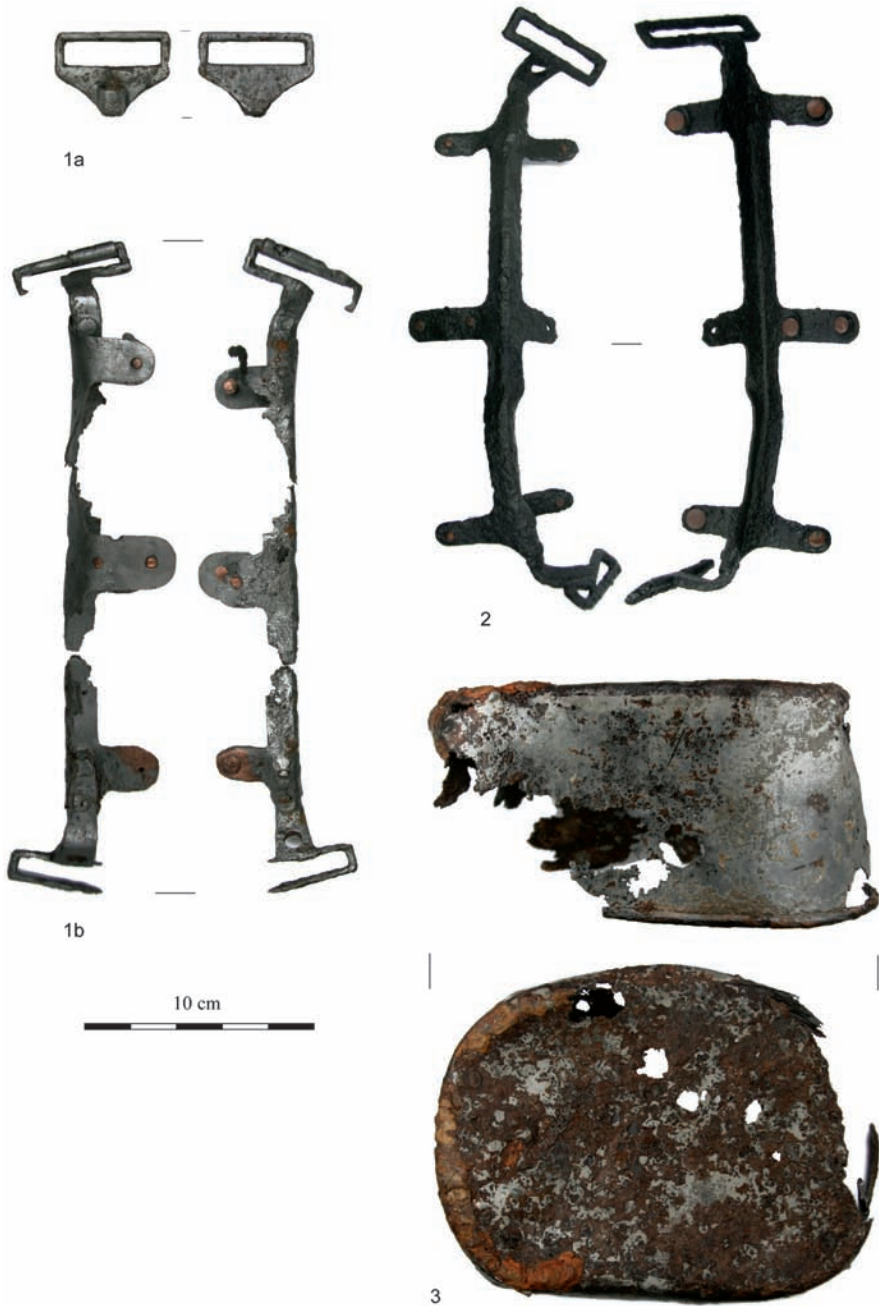


Fig. 13. Elements of uniforms and military equipment. 1a-2 – Austro-Hungarian fittings and adjustable buckle of two M1888 ammunition knapsacks; 3 – Austro-Hungarian pan of an M1904 infantry mess kit. Photo by K. Grzyb, modified by K. Rosińska-Balik

2013, 87; Schall 2014, 272). It was made of steel and has no folding handle. There are only three holes remaining of the rivets which fastened its handle. It is bent and without side hooks, with only two side-riveted fastening plates preserved. It is 7.5 cm high, 11 cm wide and 15 cm long.

In two different assemblages, four circular fittings were found – two in each of the assemblages. They were used for fastening the equipment, and were made of round, unclosed wire, about 0.2 cm thick, and were about 1.4 cm in diameter. In each of the assemblages, one of these circles were joined by means of copper soldering.

3. Weapons, small arms and artillery ammunition

Four pieces of firearms and their components, an ammunition crate, an ammunition box, cartridge clips, *en bloc* clips and cartridges, cartridge cases and bullets were discovered at the site. A piece of an artillery time fuse was also found.

The only piece associated with artillery is a part of the base of an aluminum time fuse for the M1902 Russian field cannon. It was designed for 76.2 mm shrapnel shells. It is torn, which was most likely caused by an impact of the fuse against a hard surface, because after activation, this time fuse would break the thread connecting it with the body of the shrapnel shell, and then it would fall in one piece on the ground (Fig. 14).

Firearms are represented by four rifles (Fig. 15). One of them is the Austro-Hungarian Mannlicher rifle, M1895, chambered in M1893 8 × 50 mm R ammunition (Krčma *et al.* 2016, 194; Ortner 2005, 114; Žuk 2016, 59). The rifle does not have a bolt, a trigger mechanism or a magazine case. It also lacks a butt plate and fittings, but two barrel bands are preserved. The sight leaf is set for the greatest distance, in the folded position. The barrel is deliberately bent to the left approximately 30 cm from the muzzle of the barrel. Many reference symbols are stamped on it. The number of the rifle, 1094 C, is stamped on the barrel and the receiver. At the bottom of the barrel, in the groove of the iron sight, the symbol B is stamped. The barrel is aligned with the receiver, and the symbol M is stamped next to the line indicating this alignment. At the bottom of the receiver, near the screw joining the magazine case, are the reference numbers 4 // 1 MT // 3. Thirty-eight to 40 cm along the barrel muzzle, there are



Fig. 14. 1 – Russian time fuse of 76.2 mm shrapnel shell for an M1902 field cannon. Photo by K. Grzyb



Fig. 15. Elements of the grate of the brick stove. 1-2 – Austro-Hungarian Mannlicher M1895 rifles; 3 – Russian Mosin M1891 rifle; 4 – Austro-Hungarian Steyr M1912 rifle; 5 – close-up view of the cartridge chamber of an Mannlicher M1895 rifle; 6 – close-up view of the cartridge chamber of an Mosin M1891 rifle; 7 – close-up view of the cartridge chamber of an Steyr M1912 rifle. Photo by K. Grzyb, modified by K. Rosińska-Balik

six notches on the upper side. At the top of the receiver are the symbols of the manufacturer and model – STEYR // M.95.

The second rifle of this design does not have the symbols of the manufacturer and model preserved. The rifle is devoid of the same elements as the above described one, but it also has two barrel bands preserved. The right side of the receiver, together with its rail, were broken out. The sight leaf is set to the shortest distance, and it is folded. The barrel is bent slightly downwards. The rifle number, stamped on the receiver, is 1826 M. At the bottom of the receiver, near the bolt connecting the magazine case, is the reference number 0.

The third rifle is a Russian Mosin M1891, model 1 (Žuk 2016, 92), which has been modernized. This modernization began in mid-1909 and consisted of replacing the iron sights with the Konovalov construction to adapt the settings to the new spitzer-bullet ammunition, introduced as M1908 (Chumak 2007, 20; Hýkel and Malimánek 1998, 247; Kisak 2016, 380; Orman and Orman 2015, 488; Wrobel 1999, 66). This rifle was chambered in 7.62 × 54 mm R ammunition, including both the M1891 and the M1908. The rifle has no bolt, trigger mechanism or magazine case (unscrewed). It has no butt plate or fittings. The sight leaf is set to the shortest distance, folded. The barrel is bent downwards approximately 25 cm from the barrel muzzle. The rifle number stamped on the cartridge chamber together with the manufacturer’s name is ИМПЕРАТОРСКИЙ // ТУЛЬСКИЙ // ОРУЖЕЙНЫЙ ЗАВОД // 1901 г. // N 23772 (IMPERATORSKIY // TULSKIY // ORUZHHEYNIY ZAVOD // 1901 g. // N 23772). The barrel is aligned with the receiver, and number 12 is stamped on the line indicating the alignment. On the left side of the angular receiver, the letter E is stamped, turned 90 degrees to the left.

The fourth rifle is a Steyr M1912, in its export version (Haładaj and Rozdżestwieński 2010, 31, Žuk 2016, 79). It was adapted for M1893 7 × 57 mm cartridges (Bussard 2017, 657; Ciemiński 2014, 96; Kisak 2016, 323; Labbett 1982, 30-31, Woodard 2011, 78). It was a rifle produced under German license at the Austro-Hungarian Steyr factory, intended for the Mexican market. After the outbreak of World War I, those had not been sent to the American continent were included in the armament of the Austro-Hungarian Army and were renamed 7 mm Infanterierepetiergewehr M1914 (Jung 2017, 34, 44). It was used as a weapon for the reserve force of the Austro-Hungarian Army, mainly Landsturm troops. It was from these troops that the soldiers defending the Kraków Fortress were recruited (Orman and Orman 2015, 40). The problem was the cartridge, unusual for the Austro-Hungarian Army, which made supplying and delivering the ammunition difficult. The rifle had its bolt, trigger mechanisms and magazine case removed (unscrewed). It has no butt plate or fittings. The sight leaf is set to the shortest distance, folded. The name of the recipient of the rifle is stamped on the cartridge chamber with the year of production – REPUBLICA MEXICANA // 19... The barrel is aligned with the receiver, and the number 05 is stamped on the alignment line. On the left side of the receiver, the number of the rifle and the name of the manufacturer are stamped: [burning grenade] “S”_E9081 [radiating circle]; WAFFENFABRIK STEYR // AUSTRIA. The rifle’s number is repeated on the cartridge

chamber – [burning grenade] “S”_E9081. At the bottom of the cartridge chamber, the letter N is stamped.

Components of weapons are represented by two finds. The first of these is the butt plate of a Mannlicher M1895 rifle. It has a reference number, located about 1.5 cm below the top screw on its outer part, in the form of the letter K, which is about 0.3 cm high. This butt plate has both of its fastening screws preserved. The second specimen is the sight leaf of a Mosin M1891 rifle. Its preserved length from the beginning of the sight line is about 7.8 cm. The sight leaf was broken off at the hinge. The left side of the sight leaf is bent inwards (Fig. 16).

At the site, clustered by the stove of the dugout, 38 fragments of an ammunition can of Russian origin were discovered. They were transported in twos in a larger wooden crate. Each of the crates was used to hermetically pack cardboard boxes with ammunition, each containing 15 cartridges (in three cartridge clips). In total, this ammunition can contained 300 cartridges (Dąbrowski 2009, 19). It was intended for 7.62 × 54 mm R ammunition. It was made of zinc, and it had a cuboid shape with a height of approximately 8 cm. It had rectangular front walls, overlapping and soldered with lead, and was additionally reinforced on the inside with zinc plates. The lid was able to be separated along the solder of the frame. The lid of this specimen shows traces of much bending and breaking. Right next to it, a large amount of ammunition from the ammunition can was discovered – most often in packages in cardboard boxes, and with the ammunition in cartridge clips (Fig. 17).



Fig. 16. Components of weapons discovered at site.

1 – Austro-Hungarian butt plate of an Mannlicher M1895 rifle; 2 – Russian sight leaf of an Mosin M1891 rifle.
Photo by K. Grzyb, modified by K. Rosińska-Balik

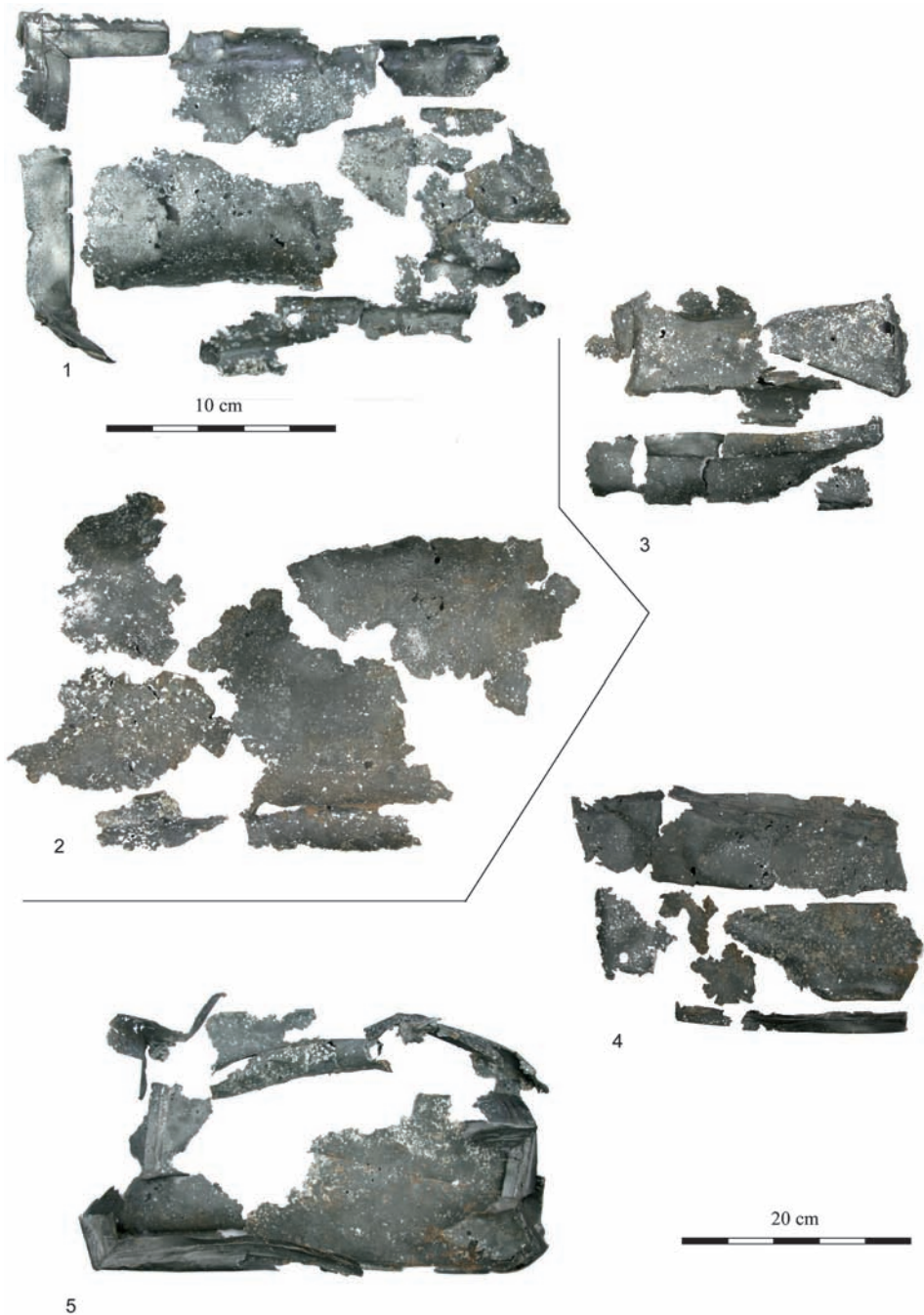


Fig. 17. 1-5 – Russian ammunition can for 7.62 × 54 mm R cartridges.
Photo by K. Grzyb, modified by K. Rosińska-Balik



Fig. 18. Examples of ammunition discovered at site. 1 – Austro-Hungarian M1890 en bloc clip for M1893 8 × 50 mm R ammunition; 2 – Austro-Hungarian M1893 8 × 50 mm R ammunition; 3 – Russian M1891 7.62 × 54 mm R ammunition; 4 – Russian M1908 7.62 × 54 mm R ammunition; 5 – Austro-Hungarian M1893 7 × 57 mm ammunition; 6 – Russian M1908 7.62 × 54 mm R ammunition. Photo by K. Grzyb, modified by K. Rosińska-Balik

One empty M1890 en bloc clip for a Mannlicher M1895 was discovered, stamped with reference number W – Manfred Weiss, Budapest. It was designed to hold M1893 8 × 50 mm R ammunition of Austro-Hungarian provenance (Kisak 2016, 426; Mötz 1996, 386, 402). A second en bloc clip of this type was also found, in which there were five cartridges with reference numbers (12)-V (3)-14 (6)-W (9)-19, which means that their production took place in May 1914, at the Manfred Weiss factory in Budapest (Fig. 18).

Cartridge clips with cartridges of Russian provenance (with two types of ammunition) were also discovered. The first group contains cartridges with M1891 round-nose ammunition. They have headstamps as follows:

(12)-06 (3)-T (6)-III (9)-II (cartridge clip with five cartridges) – third trimester of 1906, Sankt-Peterburgskiy Patronnyi Zavod, brass supplier Torgovyi Dom F. G. fon Gilyenshmidta, Tula (Dąbrowski 2009, 18);

(12)-II ТУЛЬСКИЙ 3 (6)-906 (cartridge clip with three cartridges and cartridge clip with one cartridge) – 1906, Tulskiy Patronnyi Zavod;

Illegible headstamps (two cartridge clips with three cartridges each).

Spitzer cartridges in cartridge clips of the newer type M1908, have headstamps as follows:

(12)-11 (3)-... (6)-III (9)-II (cartridge clip with five cartridges) – third trimester of 1911, Sankt-Peterburgskiy Patronnyi Zavod;

(12)-11 (3)-... (6)-... (9)-II (cartridge clip with two cartridges) – 1911, Sankt-Peterburgskiy Patronnyi Zavod;

(12)-913 (3)-K (6)-I (9)-I (cartridge clip with four cartridges) – first trimester of 1913, Luganskiy Patronnyi Zavod, brass supplier Kolchuginskiy Zavod Tsvetnykh Metallov;

(12)-... (3)-K (6)-I (9)-... (cartridge clip with one cartridge) – first trimester, brass supplier Kolchuginskiy Zavod Tsvetnykh Metallov;

(12)-T (6)-13 (cartridge clip with four cartridges) – 1913, Tulskiy Patronnyi Zavod;

(12)-10 (6)-II (cartridge clip with five cartridges) – second trimester of 1910;

Illegible headstamps (cartridge clip with two cartridges and one with three cartridges).

Another group of artefacts are cartridges. Among them are M1893 8 × 50 mm R Austro-Hungarian rounds:

(12)-I (3)-13 (6)-GR (9)-19 (cartridge) – January 1913, Georg Roth, Wien;

(12)-... (3)-... (6)-... (9)-19 (cartridge) – 19...;

An interesting group of cartridges are those designed for the Steyr M1912 rifle discussed earlier. All of the following cartridges have traces or fragments of a cartridge clip.

(12)-H. (6)-1913 (one cartridge) – 1913, Hirtenberger Patronenfabrik, Hirtenberg (Conklin 2006, 140);

(12)-H (6)-1914 (one cartridge) – 1914, Hirtenberger Patronenfabrik, Hirtenberg (headstamp without a dot);

(12)-H. (6)-1914 (one cartridge) – 1914, Hirtenberger Patronenfabrik, Hirtenberg (different font from the one above);

Illegible headstamps (one cartridge).

M1891 7.62 × 54 mm R cartridges are represented by one artefact.

(12)-II ТУЛЬСКИЙ 3 (6)-... (one cartridge) – Tul'skiy Patronnyi Zavod.

Most of this caliber of ammunition is of the M1908 type:

(12)-11 (3)-K (6)-III (9)-II (one cartridge) – third trimester of 1911, Sankt-Peterburgskiy Patronnyi Zavod, brass supplier Kolchuginskiy Zavod Tsvetnykh Metallov. It has traces of trampling (discovered at the bottom of the trench);

(12)-12 (3)-P (6)-III (9)-II (five cartridges) – third trimester of 1912, Sankt-Peterburgskiy Patronnyi Zavod, brass supplier Zavod Rozenkranc, Sankt-Peterburg. Five cartridges were probably the contents of one cartridge clip;

(12)-12 (3)-Φ (6)-III (9)-II (one cartridge) – third trimester of 1912, Sankt-Peterburgskiy Patronnyi Zavod, brass supplier Zavod Obschestva Franko-russkikh Zavodov, Sankt-Peterburg;

(12)-13 (3)-P (6)-III (9)-II (four cartridges) – third trimester of 1913, Sankt-Peterburgskiy Patronnyi Zavod, brass supplier Zavod Rozenkranc, Sankt-Peterburg. Four cartridges were probably the contents of one cartridge clip;

(12)-JI (6)-914 (one cartridge) – 1914, Luganskiy Patronnyi Zavod;

(12)-914 (3)-... (6)-... (9)-JI (one cartridge) – 1914, Luganskiy Patronnyi Zavod;

(12)-T (6)-13 (one cartridge) – 1913, Tul'skiy Patronnyi Zavod;

(12)-12 (6)-III (one cartridge) – third trimester of 1912.

All M1893 8 × 50 mm R cartridge cases were fired. They have headstamps as follows:

(12)-V (3)-14 (6)-W (9)-19 (two cartridge cases) – May 1914, Manfred Weiss, Budapest;

(12)-V (3)-13 (6)-H (9)-19 (one cartridge case) – May 1913, Hirtenberger Patronenfabrik, Hirtenberg;

(12)-VIII (3)-14 (6)-H. (9)-19 (one cartridge case) – August 1914, Hirtenberger Patronenfabrik, Hirtenberg;

(12)-I (3)-07 (6)-GR (9)-19 (one cartridge case) – January 1907, Georg Roth, Wien;

(12)-... (3)-07 (6)-GR (9)-19 (two cartridge cases) – 1907, Georg Roth, Wien;

(12)-I (3)-08 (6)-GR (9)-19 (three cartridge cases) – January 1908, Georg Roth, Wien;

(12)-I (3)-11 (6)-GR (9)-19 (one cartridge case) – January 1911, Georg Roth, Wien;

(12)-... (3)-11 (6)-GR (9)-19 (one cartridge case) – 1911, Georg Roth, Wien;

(12)-I (3)-14 (6)-GR (9)-19 (one cartridge case) – January 1914, Georg Roth, Wien;

(12)-I (3)-... (6)-GR (9)-19 (one cartridge case) – January, Georg Roth, Wien;

(12)-... (3)-... (6)-... (9)-19 (one cartridge case) – 19...

Also found were 12 unfired 7.62 × 54 mm R cartridge cases, whose headstamps are illegible, and thus it is impossible to indicate the ammunition model. There are clear indica-

tions that, for two of them, the bullet was broken apart (before the deposition), and another one additionally has traces that the neck was bent inwards into the cartridge case.

None of the M1891 7.62 × 54 mm R cartridge cases were fired.

(12)-II ТУЛЬСКИЙ З (6)-906 (four cartridge cases) – 1906, Tul'skiy Patronnyi Zavod. In three cases, there are indications that the bullet was broken apart;

(12)-06 (3)-Т (6)-III (9)-II (three cartridge cases) – third trimester of 1906, Sankt-Peterburgskiy Patronnyi Zavod, brass supplier Torgovyi Dom F. G. fon Gillenshmidta, Tula;

(12)-B (6)-1906 (two cartridge cases) – 1906, Manfred Weiss, Budapest. In both cases, the bullet was broken apart, and the neck was bent inwards. They represent Austro-Hungarian production for the Russian Empire. One-hundred million cartridges were ordered by Russian Empire from this factory because of greater demand due to the war with the Empire of Japan;

None of the M1908 7.62 × 54 mm R cartridge cases were fired.

(12)-913 (3)-K (6)-... (9)-JI (one cartridge case) – 1913, Luganskiy Patronnyi Zavod, brass supplier Kolchuginskiy Zavod Tsvetnykh Metallov. There are traces that the bullet was broken apart;

(12)-914 (3)-K (6)-I (9)-JI (one cartridge case) – first trimester of 1914, Luganskiy Patronnyi Zavod, brass supplier Kolchuginskiy Zavod Tsvetnykh Metallov;

(12)-T (6)-... (three cartridge cases) – Tul'skiy Patronnyi Zavod;

(12)-12 (6)-II (one cartridge case) – second trimester of 1912.

There are no unfired M1893 7 × 57 mm cartridge cases. The headstamps of three artefacts are as follows:

(12)-H (6)-1913 (one cartridge case) – 1913, Hirtenberger Patronenfabrik, Hirtenberg;

(12)-H. (6)-1913 (one cartridge case) – 1913, Hirtenberger Patronenfabrik, Hirtenberg. Has remains of the cartridge clip (it might be that the bullet was broken apart after deposition);

Illegible headstamps (one cartridge case).

All the bullets discovered at the site come from 7.62 × 54 mm R ammunition. Some of them are of the M1891 type. Within this type, we can distinguish eight bullets with traces of a double-spot neck crimp, seven of which come from dismantled ammunition (which must have happened before the features were filled in with soil), and one of which has traces of having been fired. Another type – with a three-spot crimp – is represented by three unfired specimens and an additional one for which it is not possible to determine whether it had left the barrel due to the degree of corrosion. The number of spot crimps depends on the manufacturer.



Fig. 19. Examples of bullets discovered at the site.

1 – Russian bullet of M1891 7.62 × 54 mm R ammunition;
2 – Russian bullet of M1908 7.62 × 54 mm R ammunition.
Photo by K. Grzyb, modified by K. Rosińska-Balik

Bullets of the M1908 type did not have these spots – the crimp went around the groove. Eleven of them had not been fired; additionally, one of them has a fragment of the neck's cartridge case (which may have happened after deposition); one was fired; and, in another case it was not possible to determine whether it had left the barrel (Fig. 19).

4. Elements and equipment of field fortifications

The last category, related to field fortifications, is comprised of the following items: the dugout's door hinge, nails and a grate hook. Also, some pieces of the decayed wood from the construction of the trench were discovered (Fig. 20).

All of the six discovered nails are quadrangular in cross-section and appear to have been bent in half (in four cases) or bent in different directions (in two cases). They are made of steel and can be divided into two groups. The first consists of three nails with a cross-section of about 0.6×0.6 cm, and which are 17.8-18.3 cm long, including one whose full length is not preserved. The second group consists of three nails, 0.4×0.4 cm in cross-section and 7.8-12 cm long. They were probably used to join wooden elements of the field fortifications' supporting formwork.

The discovered hinge, approximately 16.5 cm long, was probably a fastening element of the dugout door and was attached to the door frame. The size of the plate attached to the wood is approximately 6.5×6.5 cm. The plate has three nail holes (two are drilled approximately 1 cm away from the corners, and one is in the middle, approximately 2.5 cm from a side edge). The diameter of the joint pin is about 1.1 cm, while its length is about 5 cm. The lower decorative element, crowned with a sphere about 1.5 cm in diameter, turns into a cone of about 2 cm in length, with a diameter of about 0.8 cm at the bottom and about 1.5 cm at the top, and with a groove in its upper part, which goes around the entire perimeter of the top, and is about 0.5 cm wide and 0.3 cm deep.

Related to the stove is a forged, S-shaped grate hook, folded over the ring. It is made of part of a Russian iron horse bit. The ring is round in cross-section; it is about 0.5 cm thick, and about 5 cm in diameter. The hook is approximately 6.8 cm long and 0.7 cm thick. The bend of the hook allowed for a rod, about 1.5 cm in diameter, to be suspended from it. The tip of the hook was rolled up and hammered in, for a length of approximately 1.2 cm. It is highly likely that it was used to hang a cooking pan, a pot or a cauldron over the fire.

ANALYSIS OF THE FINDS. DETERMINATION OF THE EVENTS AND THE ARMIES OCCUPYING THE FORTIFICATIONS

In the analyzed collection, there are finds which, to varying degrees, provide evidence for the genesis of the already explored field fortifications, and which are, in various ways, useful in reconstructing the events of November 1914. The finds that cannot be ascribed to any particular side of the conflict are as follows: a safety pin, nails, a hinge, a grate hook

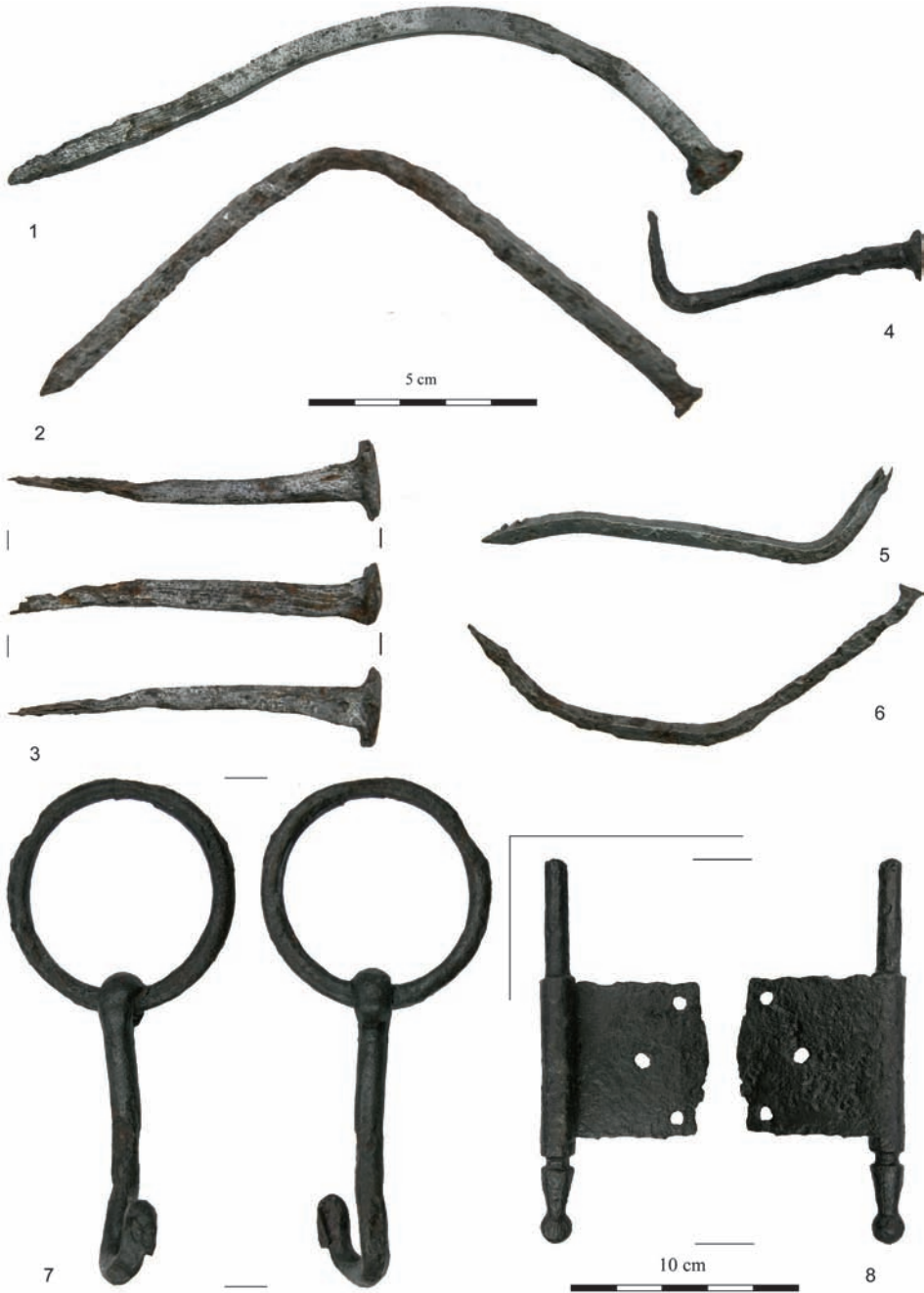


Fig. 20. Elements and equipment of field fortifications. 1-6 – nails of supporting formwork; 7 – grate hook; 8 – hinge of the dugout door. Photo by K. Grzyb, modified by K. Rosińska-Balik



Fig. 21. Examples of cartridges with traces of damage. 1-7 – Russian 7.62 × 54 mm R cartridges with traces of intentionally broken apart bullets; 8 – Russian M1908 7.62 × 54 mm R cartridge with traces of trampling. Photo by K. Grzyb, modified by K. Rosińska-Balik

and the rifles used to make the grate. The rifles have defects, and their provenance, both Austro-Hungarian and Russian, cannot help us resolve the question of who made the grate from them. Most likely, they were collected from the battlefield during a break in fighting and considered unfit for further use in combat.

Some of the finds of known attribution demonstrate the presence of both armies at this site. On the one hand, this is very valuable information, because it shows the dynamics of the military operations and the capturing of each other's positions, along with the fact that there were soldiers from both sides of the conflict at the site. This group of finds includes both Russian and Austro-Hungarian small arms ammunition, components of the weapons of both sides, such as the Austro-Hungarian butt plate and the Russian sight leaf, two Russian coins and one Austro-Hungarian coin, and three buttons with broken shanks – one Austro-Hungarian and two Russian.

On the other hand, the finds suggesting a more intensive use of these fortifications by a specific army, as well as indicating the nature of the military operations are such finds as: a large amount of equipment of the Austro-Hungarian Army – the mess kit, the pieces of two knapsacks and the buckles, which must have been lost in the course of some sudden events, rather than during a period of passive stay at the site. Also, the presence of a fragment of the Russian time fuse suggests that this area was shelled by artillery. Significant is the fact that bullets had been broken apart, and their pieces were found, lying in large quantities next to the ammunition can, near the dugout's stove. This must have been done to obtain gunpowder to light a fire in the stove, which would not have been done using one's own ammunition, so it must have been done by Austro-Hungarian soldiers after they had taken over the ammunition abandoned by the Russians (Fig. 21). The analysis of the ammunition shows that there are no Russian cartridge cases, while the amount of Austro-Hungarian ones is large. This indicates a prolonged stay of the Russian Army in this place, and a violent and short one of the Austro-Hungarian Army, associated with their assault and the withdrawal of Russian troops from this line. The presence of two fired Russian bullets – even though it is not a representative sample like a Russian time fuse – could be a confirmation of this. In the collection, there is no bullets of ammunition intended for the Austro-Hungarian Mannlicher rifle.

The form of the trenches constructed at the site suggests Russian attribution. The location of the site with developed fortifications is closely related to the strategic use of the natural features of the terrain, and to the distance separating it from the forts of the Kraków Fortress. The location of the site on a slope with southern exposure, towards Kraków and the east, with parallel lines of shooting trenches pointing towards the town of Goszcza, indicates the direction of the planned attack and the direction of the enemy's expected presence. The berms of the trenches and shooting positions were facing in these directions, which further confirms the Russian character of the fortifications.

After the mobilization was announced, the vegetation in the forefield of the forts was cleared to increase the visibility of the advancing troops. Probably, these forts were visible

to the Russian Army from the hill because, for example, the theoretical visibility of a single house in the terrain is 8.5 km, while that of a windmill – 10.5 km (Środulska-Wielgus 2002, 135). The forts of the Fortified Area of the Kraków Fortress took part in the battles fought nearby (fort 49 “Krzesławice” and fort 49 1/4 “Grębałów”). They defended the northern approach to the Fortress, *i.e.*, in the direction where the site under discussion is located. The distance between the site and Fort 49 “Krzesławice” was about 10 km, ensuring the safe stay of soldiers in this place, which was beyond the range of the Fortress artillery. The range of the cannons in these forts did not reach such a distance; it was only possible to shell the forefield of the site. The armament of the heaviest guns of the main artillery fort, 49 “Krzesławice”, *i.e.*, six 15 cm M1861 cannons, could only reach a distance of 6200 m (shrapnel shells) – 6400 m (artillery grenades; Ortner 2007, 251).

The presence of nails and decayed wood suggests that the fortifications were supported with formwork. In the case of the dugout, the hinge provides indirect evidence that it had a door. Also, the analysis of the depth of these features suggests that the dugout’s roof was elevated above the ground. Worth noting is the *ad hoc* manufacture of some of the bricks used for the construction of the stove from the available clay. Of interest is the discovery of the Steyr M1912 and the ammunition to go with it, which were export commodities to Mexico. This proves that the reserve force, *e.g.*, Landsturm, who were the crew of the Kraków Fortress and who made raids on the Russian positions, participated in the fights as well. Equally interesting is the discovery of two cartridge cases for the Russian Mosin rifle, made in 1906 in the Austro-Hungarian Monarchy at the Manfred Weiss factory in Budapest, ordered in connection with the war between the Russian Empire and the Empire of Japan, and used after the outbreak of World War I against Austria-Hungary.

The above conclusions are confirmed by historical sources. Most likely, the construction of these positions had already begun in the initial phase of the Russian offensive, *i.e.*, from November 14, 1914. The information about the capture of Goszcza indicates that the Austro-Hungarian Army possibly carried it out on November 17, 1914. It pushed back the Russian Army and continued its attack towards Słomniki. The finds of Austro-Hungarian origin discovered in the Russian field fortifications are related to this episode.

The analyzed results of the excavations are a good example of the archaeological verification of historical sources. Such results may often enrich the information provided in the literature. Modern battlefields yield large amounts of archaeological finds, which often carry important information that is easier to interpret than materials from older epochs. There is still a real need to develop the research methodology for such specific types of sites, where interdisciplinarity could satisfy, at least, some of the expectations placed on research (Karasiewicz and Wrzosek 2019; Niebylski 2018; 2020; Sabaciński 2015; Zalewska 2019; Zalewska *et al.* 2019).

References

- Adjustierungsvorschrift...* 1911. *Adjustierungsvorschrift für das k. u. k. Heer 1910/1911*. Wien: Verlag Militaria.
- Bator J. 2005. *Wojna galicyjska*. Kraków: Wydawnictwo Libron.
- Bussard M. 2017. *Ammo Encyclopedia For all Rimfire and Centerfire Cartridges, plus Shotshells*. Minneapolis: Blue Book Publications.
- Chumak R. N. 2007. *Russkiy 7,62-mm vintovochnyi patron. Istoriya i evolutsiya*. Sankt-Peterburg: Atlant.
- Cięmiński J. 2014. *Znakowanie łusek wojskowej amunicji strzeleckiej wybranych krajów europejskich* (= *Archeologia Wojenna Extra* 1). Gdów: Instytut Wydawniczy Archeologia Militaris.
- Conklin Ch. 2016. *Military cartridge headstamps. Collector's guide. Code book*. Westminster: Heritage Books.
- Dąbrowski J. 2009. *Carskie trzy linie. Rosyjski 3" nabój karabinowy (7,62 x 54R) w latach 1891-1917*. Warszawa: Self-published.
- Dąbrowski J. 2015. *Wielka wojna 1914-1918. Tom. I. Oświęcim: Napoleon V*.
- Elterlein S. 2016. *Taktyka szturmowa armii austro-węgierskiej i niemieckiej w I wojnie światowej*. Oświęcim: Napoleon V.
- Haładaj K. and Rozdżestwieński P. 2010. *Karabiny i karabinki Mauser 98 w Wojsku Polskim w latach 1918-1939*. Warszawa: Wydawnictwo ZP.
- Hinterstoisser H., Ortner Ch. M. and Schmidl E. A. 2006. *The Austrian Mountain Troops. History, Uniforms and Equipment of the Austrian Mountain Troops from 1906 to 1918*. Wien: Verlag Militaria.
- Horstenau G. E. 1932. *Österreich-Ungarns letzter Krieg 1914-1918*. Wien: Verlag der Militärwiss. Mitteilungen.
- Hýkel J. and Malimánek V. 1998. *Náboje do ručních palných zbraní*. Praha: Naše vojsko.
- Jung P. 2017. *Armia austro-węgierska w I wojnie światowej (1). 1914-1916* (= *Men-at-Arms* 392). Oświęcim: Napoleon V.
- Karasiewicz K. and Wrzosek J. 2019. Amunicja strzelecka z badań archeologicznych pozostałości frontu nad Rawką i Bzurą (1914-1915). Próba analizy. In A. I. Zalewska (ed.), *Archeologiczne przywracanie pamięci o wielkiej wojnie w rejonie Rawki i Bzury (1914-1915)*. Warszawa: Instytut Archeologii i Etnologii PAN, 261-275.
- Kisak P. F. 2016. *A comprehensive guide to rifle ammunition vol. 2 of 2*. Virginia: Diamond Publications.
- Krčma V., Hýkel J. and Neshyba P. 2016. *Atlas nábojů do ručních palných zbraní*. Praha: Naše vojsko.
- Labbett P. 1982. *Encyclopedie mondiale des munitions modernes*. Paris: Pygmalion.
- Mötz J. 1996. *Österreichische militärpatronen. Band 2*. Wien: Verlagsbuchhandlung Stöhr.
- Niebylski J. 2018. Fenomen zamka skałkowego. Skałki ze wzgórza wawelskiego odbiciem wytwórczości skałkarskiej monarchii austriackiej. *Krzysztofony. Zeszyty Naukowe Muzeum Historycznego Miasta Krakowa* 36, 57-74.

- Niebylski J. 2020. Wielka Wojna na nadwiślańskim przedpolu Twierdzy Kraków. In K. Tunia (ed.), *Kartki z dziejów igołomskiego powiśla*. Igołomia, Pękowice: Wydawnictwo i Pracownia Archeologiczna Profil-Archeo, 251-272.
- Niedziółka K. 2016. The prospect of digitalization of Polish Archaeological Record on an example of materials from the turn of Bronze and Iron Age from area of Pomeranian Voivodeship (Northern Poland). *Sprawozdania Archeologiczne* 68, 121-144.
- Orman K. and Orman P. 2015. *Wielka Wojna na Jurze. Działania i cmentarze wojenne z roku 1914 na Wyżynie Krakowsko-Wieluńskiej i terenach przyległych*. Kraków: Wydawnictwo Libron.
- Ortner C. M. 2005. *Storm Troops. Austro-Hungarian Assault Units and Commandos in the First World War. Tactics, Organisation, Uniforms and Equipment*. Wien: Verlag Militaria.
- Ortner C. M. 2007. *The Austro-Hungarian Artillery from 1867 to 1918. Technology, Organization and Tactics*. Wien: Verlag Militaria.
- Ortner C. M. and Hinterstoisser H. 2013. *The Austro-Hungarian Army in the First World War – Uniforms and Equipment – from 1914 to 1918. Band 2*. Wien: Verlag Militaria.
- Pałosz J. 2012. *Śmiercią złączeni. O cmentarzach z I wojny światowej na terenach Królestwa Polskiego administrowanych przez Austro-Węgry*. Kraków: Wydawnictwo Libron.
- Przybyła M., Podsiadło M. and Stefański D. 2019. Prehistoric defensive structures in the Szreniawa valley. *Sprawozdania Archeologiczne* 71, 303-339.
- Sabaciński M. 2015. Relikty archeologiczne Wielkiej Wojny. Znikające dziedzictwo, poza nawiasem nauki i konserwatorstwa. *Ochrona Zabytków* 68, 131-140.
- Sbornik... 1915. *Sbornik opisaniy predmetov i materialov zagotovaemykh Intendantstvom dlia dovolstviya voysk*. Petrograd: Tipografiya Shtaba voysk Gvardii i Petrogradskago Voennago Okruga.
- Schall M. 2014. *Der Zauber der Montur. Katalog des k.u.k. Armee-Ausstatters Max Schall in Wien, 1914/1915. Kommentierte Neuauflage*. Wien: Verlag Militaria.
- Środulska-Wielgus J. 2002. Zadrzewienia maskujące Twierdzy Kraków jako element tworzenia współczesnego krajobrazu miasta. In J. Bogdanowski and M. Holewiński (eds), *Zamki. Miasta warowne. Ogrody. Relacje historycznych założeń fortyfikacyjnych oraz terenów zielonych w miastach zabytkowych*. Kraków: Komisja Architektury i Urbanistyki PAN O/Kraków, Samodzielna Katedra Teorii Architektury Krajobrazu i Kompozycji Ogrodowej Wydziału Architektury PK, 127-146.
- Woodard T. W. 2011. *Shooter's bible. Guide to cartridges*. New York: Skyhorse Publishing.
- Wrobel K.-H. 1999. *Drei Linien. Die Gewehre Mosin-Nagant*. Schwäbisch Hall: Journal-Verlag Schwend GmbH.
- Zalewska A. I. (ed.) 2019. *Archeologiczne przywracanie pamięci o wielkiej wojnie w rejonie Rawki i Bzury (1914-1915)*. Warszawa: Instytut Archeologii i Etnologii PAN.
- Zalewska A. I., Czarnecki J. and Karszys G. 2019. *Krajobraz Wielkiej Wojny. Front nad Rawką i Bzurą (1914-1915) w świetle teledetekcji archeologicznej i źródeł historycznych*. Warszawa: Fundacja Przydrożne Lekcje Historii.
- Żuk A. B. 2016. *Karabiny, karabinki i pistolety maszynowe. Encyklopedia długiej broni wojskowej XX wieku*. Warszawa: Fundacja Historia i Kultura, Bellona.