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MINING AND METALLURGICAL ACTIVITY IN THE MEDIEVAL SERBIA

Abstract

The mining and metallurgical activity has a centuries-old tradition in Serbia. Copper, iron and gold are the basic metals in the ore of eastern Serbia. Lead, zinc, iron and silver ore are present in central Serbia, while antimony and lead ore are predominant at the location of western Serbia. The strength of Nemanjić's Serbia was mostly based on the development of this activity. With the arrival of the Turks, the mining and metallurgical activity weakened, and at the beginning of the 18th century it completely become extinct. Almost all current mines of polymetallic ores in Serbia appeared on the locations of medieval mines.

Keywords: mining, metallurgy, foundry, medieval Serbia, gold, silver, copper, iron, lead, zinc

1 INTRODUCTION

In the area of today's Serbia, south of the rivers Sava and Danube, there are several deposits of polymetallic ore that have been exploited since ancient times. The strength of the ancient Hellenes, Illyrians, Romans, Byzantines and then Nemanjić in the Middle Ages, was largely based on tools, weapons, money, jewelry and other metal products from these mines. There is a record that in the ancient times "Egyptian masters exploited gold from the source of the river Nile to the slope of the Carpathians" [1]. So, they exploited gold in the area of the current Bor - Majdanpek region, which is still one of the important producers of copper and gold. It is estimated that about 200 tons of gold were mined in Serbia in the period from 1250-1990 [1].

In central Serbia, from Avala, further south of Kosmaj, Rudnik, Kopaonik, Rogozna, Majdan mountain, Kriva Feja, in the east Bor-Majdanpek region, in the western Serbia Krupanj-Loznica region, all these are areas where there are several sites of non-ferrous, precious, ferrous and other metals. Many of these deposits were exploited in the old century, and in addition to the mines, the smelters, mints, foundries and other metallurgical plants for metal processing were there.

Sočanica, a settlement between Zvečan and Leposavić, used to be the seat of Roman mining supervision, and the money of Alexander the Great and later Emperor Theodosius in the new century was minted on Kriva Feja and Blagodan [2]. Roman money was minted near Gračanica in the

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time of Emperor Trajan ("Metallum Ulpi-anum"), in Rudnik in the time of Septimius Severus, and in Medvedja (Lece) in the time of Emperor Constantine [2].

The invasions of the Huns and Avars, as well as the migration of peoples from the 5th to the 9th century, slowed down or stopped the exploitation of mines, and after this period, the mining and metallurgical activities developed as well as the power of the Serbian state strengthened. During the reign of Stefan Nemanja and other Nemanjićs, and especially during the reign of King Uroš I, until the arrival of the Turks, practically until the fall of Novi Brdo in 1455, the full development of mining and metallurgy in Serbia took place.

2 THE PERIOD UP TO THE FIFTEENTH CENTURY

After the 10th century, there was a constant development of mining and metallurgical activities. John of Ephesus wrote in the 6th century that the South Slavs "... have gold and silver, horse stables and many weapons ..." [2]. The Frenchman Brockier and the Byzantine Critovul wrote about the deposits of silver, gold and lead in Serbia in the 15th century [2]. In 1433, Brokier wrote that there were five gold and silver mines in Serbia.

The flourishing of mining and metallurgy in Serbia occurred, especially, after the arrival of the Sasa-Germans from Erdelj and the Romanian Banat during the reign of King Uroš (1243-1276) and Jelena Anžuska in the second half of the 13th century. At each mine there was a colony of foreign workers and merchants; Sasa, from Dubrovnik, Kotor, Greece and others. who lived according to their own autonomous laws and customs. Sasa formed the settlement of Janjevo near Gračanica, where they have survived to this day, so they are known as "Janjevci" and as hard-working and good craftsmen. The King Uroš I signed an agreement on trade with

the people of Dubrovnik in 1276 for five years, and in 1281 this agreement was extended indefinitely.

The Lese ore deposit is mentioned in 1280 as a colony of Kotor and Dubrovnik [2].

In the Dubrovnik records "Trepca" was mentioned for the first time in 1303, and many Dubrovnik families who lived next to the mines of Serbia (Lukačević, Prodanović, Bobalević, etc.) were also recorded.

The Kopaonik mines and "Trepca" in Stari Trg had the greatest power in the 13th and 14th centuries, and Novo Brdo in the first half of the 15th century during the time of the despot Djuradj Brankovic (1427-1456). The Law of Emperor Dušan from 1346 defined the rules for exploitation, production and processing of metals. This law prescribed very strict rules, especially for gold and silver processors. Important centers had their own local law both before and after the Emperor Dušan: the Janjevo, Sasi, Novobrdo, Rudnik, Dubrovnik, Kotor and other laws. Despot Stefan Lazarević (1389-1427) passed the unique Mining Law in 1396, incorporated local laws into it, and supplemented and finally confirmed it on January 29, 1412 [3]. One of the signatories of this second law was Bogdan Jug, obviously the grandson of the old Jug Bogdan and probably the son of the oldest of the Jugović brothers, Boško Jugović, because according to the old and current Orthodox custom, the first grandson got his grandfather's name. The signatories of this law were Radič from Trepča, Lovren and Tripun from Rudnik and several craftsmen, what testified to the versatility of the issuer and author of this law. The first Serbian coins made of silver (electron) and copper (billion) appeared during the reign of King Radoslav (1228-1234), and the following kings also had their own coins: Vladislav (1234-1242), Uroš I (1242-1276), Dragutin (1276-1282), Milutin (1282-1321) and

other rulers. There are records that the mint worked in Mojkovac during the reign of King Uroš I, in Trepča around 1400, and Prince Lazar had a mint and especially a mint of weapons.

Trepca and Janjevo are mentioned in 1303, Novo Brdo in the time of King Milutin, and Podrinje's Crnča in 1352, Bo(hor)rina in 1415 and Krupanj in 1422. In 1328, Janjevo is said to have iron ore and a foundry [3].

The main merchants were from Dubrovnik and in 1422 they exported 5672 kg of silver from Serbia. Their headquarters on Kopaonik were in 1426 in the settlement of Kovači, where there were several iron mines and smelters. Djuradj Brankovic leased 200,000 ducats a year to the people of Dubrovnik for Novo Brdo [3]. In 1422, there was an iron mine, smelter and foundry in Krupanj. Many called Kopaonik a "silver mountain", and in the 15th century, the Byzantine writer Kritovul described Serbia as "the seat of all countries and one Maidan of gold and silver". Many settlements were named after the type of activity present: Kopaonik, Rudnik (Majdan) Rudare, Rudnica, Kovači, Ljevoša (foundry, near Peć), Bakarnjača, Železnik (now Majdanpek).

In the 14th and 15th centuries, the lead ore was exploited on the Rogozma mountain, gold was washed in streams, and in Gluha Vas there was an iron mine and smelter that was processed in the neighboring Novi Pazar. In Stari Trg and its surroundings there were eight deposits of lead-zinc ore in the 14th century; the richest in silver were the ore of Novo Brdo, Rudnik and Stari Trg ("Trepča"), and with gold the Lece deposit (Medveđa), all mines as in today.

In the period 1426-1432, the Kabušić brothers, from Dubrovnik, exported 3,500 kg of silver from Novo Brdo, out of which about 93% was shipped to Italy [7].

There were several deposits of polymetallic ore in the Podrinje area, copper ore in Lipnik near Krupanj, and lead-copper ore in Kučajna and Rudnik. There

are about 250 remains of the old smelters and metallurgical slags in Trepča and Kopaonik [3].

The main export of silver and other metals from Serbia was done by the people of Dubrovnik and Kotor with their caravans, and at the end of the 14th century, about one ton of gold was produced in Serbia annually. In the time of Nemanjić, many churches and monasteries were built in Serbia, which were covered with lead sheets, and this lead tin roof has survived to nowadays.

With the arrival of the Turks, the foreign workers and traders left and mining and metallurgical activities gradually weak. After the Battle of Kosovo, the despots Stefan Lazarević and Djuradj Branković, as well as Serbia, had the vassal autonomy. In the mining and metallurgical centers, there were mostly Turkish and Serbian officials, and the Turks incorporated the existing Serbian mining laws into their own, which they passed in 1520, 1536, 1566, and for Novo Brdo in 1494. [3] These laws of the Suleiman the Magnificent (1520-1566) were called the Canons and were based on the Muslim religious law.

The Serbian despotism was abolished by the Turks in 1459, four years after the fall of Novo Brdo, and after that, a completely Turkish period arose.

It is officially believed that the Middle Ages ended with the discovery of the "New World", i.e., the discovery of a new continent: America, discovered by Christopher Columbus (1492) and Amerigo Vespucci (1499 and 1501/02). America is also named after Amerigo. Some countries move that border of the Middle Ages, depending on their situation, and that was the time of great changes, renaissance, humanism, inquisition, etc.

This work also covers the time after 1500, because the mining and metallurgical activity in Serbia was intensive in the 16th century, and then it weakened and died out only at the end of the 17th century.

3 THE TURKISH ERA

Although it is officially considered that the Turkish time came immediately after the Battle of Kosovo in 1389, for the next 30 years the Turks did not appear much in Serbia. The Despot Stefan Lazarević fulfilled his vassal obligations towards Turkey, so as a vassal of Sultan Bayezid, he participated with his armored men in the famous battle near Angora (Ankara), in 1402, in which Khan Tamerlane defeated and captured the Sultan Bayezid. At that time, the Serbian armored men were the most elite soldiers, and Tamerlane respected knowledge; he was a top astronomer and his court was the world's strongest astronomical center. Tamerlan allowed Stefan Lazarevic and Djuradj Brankovic to return to Serbia with their army, but he previously singled out masters, masons, carpenters, foundries, miners and other craftsmen from the Serbian army and kept them in Turkey for his own needs. Serbian armored vehicles were known in the 14th century and in the battle of Kosovo, but primarily thanks to highly developed metallurgy, i.e., high-quality manufacturing of armor, shields, spears, sabers and other weapons. There were various types and shapes of armor: plate, wire (mesh), for people, horses, etc. And that is a specific field of metallurgy that had a long tradition in Serbia. In other words, the foundry and metal processing were highly developed activities in Serbia in the period 1200-1700.

In the middle of the 15th century, the mining and metallurgical town of Novo Brdo, which is about 20 km east of Pristina, had about 40,000 inhabitants and was one of the largest European centers. At that time, for example, London had only about 5,000 inhabitants. The Turks had already conquered Belgrade and the area up to Belgrade, and Novo Brdo was still independent, under the Serbian rule. The had its own mine, foundries, production of weapons, money, food and its own economy. For two

years, the Turks unsuccessfully attacked and besieged it, but they did not capture it until 1455. Outraged by the resistance of the people of Novo Brdo, the Turks destroyed Novo Brdo in 1455, and in 1456, 50,000 Serbian prisoners from Novo Brdo and the surrounding area were sold at the Constantinople Slave Market. After this, the Novo Brdo area never recovered, and that was a breakdown for the Serbian mining and metallurgical activity, as well as for the Serbian state.

The Turks occupied Rudnik in 1438, and in the period from 1442-1518 the people of Dubrovnik mined silver and copper from Rudnik. The 743 kg of pure silver was produced in Rudnik in 1516, and in the period 1476-1523, 740-820 kg of silver was produced [3]. In the middle of the 16th century, the iron ore was exploited, from which the cannon balls were cast.

In the village of Ba (Suvobor), in the second half of the 16th century, the smelters and foundries operated in which weapons, cannonballs and mining tools were produced.

In the Takovo region and on Kosmaj, there are still landfills of foundry slag. The Turks captured Kučajna and Braničevo in 1439, and in 1553 Kučajna became the center of the Cadillac and the main mining and metallurgical center of this region [3]. In 1829, Otto Pirch wrote that there was a mine in Kučajna in the time of Prince Lazar. The Trepca mine, foundry and market in Stari Trg had 521 households at the end of the 16th century, and only 50 households at the end of the 17th century, during the Austro-Turkish wars.

In Turkish times, the wealthier Serbs leased certain mines in Podrinje, Rudnik and Kopaonik until 1540, but the Turks took power and control, taking metal and metal products to Constantinople, and the Sasi, Germans, people from Dubrovnik, Kotorans and others foreigners left Serbia,

which meant a decline in mining and metallurgical activities in Serbia.

The Austro-Turkish wars at the end of the 17th century and in the first third of the 18th century resulted in great migrations of Serbs in 1690 and 1735, after the defeat of Austria, on whose side the Serbs fought. Then, in 1690, the fleeing from Turkish revenge and terror, 37,000 Serbian families from Kosovo, Metohija and other parts of Serbia crossed the rivers Sava and Danube and settled in Austro-Hungary. Apart from the Serbs, the foreign craftsmen and merchants also left Serbia, so after these wars and migrations, the exploitation of mines in Serbia practically stopped, that is, the mining and metallurgical activity stopped.

In Serbia, on the sites of former smelters and foundries, there are a large number of landfills of their slag with a significant content of useful metals. These slags can be processed in modern production under certain conditions. This is the case, for example, in the "Trepca" lead smelter in Zvečan, in the period 1968-1975, 800-1200 t of old slag were processed annually, which in practice are called the "Roman slag" and which contained 8-9% lead, 2-3% zinc, 30-40% iron, 1-2% antimony, 0, 02-0.05% silver, etc. Metal slag recycling is an integral part of modern production. These slags are still present in the village of Babe, near Ralja.

4 FOUNDRY

Casting and processing of money and jewelry, mints and filigree have always been present in the mining settlements. Casting of church bells, cannon pipes and cannons belongs to a specific and highly professional metallurgical field. Due to the mass construction of churches and monasteries during the Nemanjić's time, there was a need to manufacture the church bells, which also contributed to the development of foundry. The quality of

metal, size, mass and dimensions of a bell, as well as the specific properties of a pendulum, affect the quality, type and power the sound propagation of a particular bell.

The two oldest preserved medieval church bells in Serbia are the two Rhodope bells, which were cast in August 1432 [5]. Little is known about the Rhodopes, it is only known that he was one of the prominent lords in the time of Djuradj Branković, with whom he participated on the side of Sultan Bayazit in the battle of Angora, in 1402.

The first, the older bell, donated by the lord Rhodope, was donated to the Monastery of the Mother of God Hvosnaska, which was also called Mala Studenica, and it was the seat of the episcopate in the 12th century and since 1381 the seat of the metropolitanate in the parish Hvosno [5]. This monastery was located in the present village of Studenica, near Pečka Banja, in the north of Metohija in the municipality of Istok, about 15 km east of Peć. It is written that, before the arrival of the Turks, this monastery received milk through ceramic pipes from the mountain Kopaonik, which is above this monastery. In this monastery, Saint Sava reconciled the brothers Stevan and Vukan and persuaded them not to fight against each other. After the migration of Serbs 1690-1735, the monastery was demolished, and from the stones of the monastery walls, the settlers Arnauts built houses and a mosque in the middle of the present village. There are still many remains of the monastery walls, but the Serbs never researched anything, so they did not even restore this archeological site. When the Arnauts excavated and took stone from the monastery walls in 1891, they also excavated a bell that read: "Most Holy Mother of God, receive this small contribution from the many sinful slaves of your Rhodopes in the summer of 1432, on the 2nd day of August, very sinful Rhodope" [5]. This bell was bought by the then Vice

Consul of Serbia in Pristina T. Stanković with the help of Nikola Pašić, Minister of

Foreign Affairs of Serbia. This bell is soprano in sound, Figure 1.



Figure 1 *The older Rhodope bell*

The second Rhodope bell, Figure 2, was found in the village of Banje about 15 km east of the previously described Monastery in the village of Studenica. Before 1432, Rhodope built the church of St. Nicholas, in the village of Banje as his endowment, and in Turkish times this church was destroyed. When the inhabitants of the village of Banje wanted to renovate this church in the 19th century, they found and excavated another, younger, Rhodope bell. Banje is still a purely Serbian village. The Turks did not allow the reconstruction of this destroyed church, so the Serbs from Banja buried the bell to hide it from the Turks, who then melted the church bells and made weapons out of them. In the First World War, in 1916, the Austro-Hungarian soldiers searched for buried Serbian cannons and ammunition in the entire

Spa, found and excavated this Rhodope bell and transferred it to the Patriarchate of Peć, where it is still kept in the treasury. This younger bell bears the cast date of August 11, 1432, it sounds like an alto, and the donor dedicated it to the church of St. Nicholas in the village of Banje, and on it is the figure of St. Nicholas. This church was destroyed until 1930, when the locals began to rebuild it, and then, next to the south wall of the church, they discovered Rhodope's tombstone with an epitaph on which it says that Rhodope died on February 7, 1436.

There is little information about Rhodope, and it is only known that he had brothers Nikola and Stefan and that he was married to Olivera with whom he had two sons, Jovan and Stepan.

The people of Dubrovnik made cannons in the 15th century. In addition to the master casters from Italy, the masters from Serbian areas were also engaged in casting cannon tubes and making cannons. In the 15th century, Ivan Ognjenović, Marko Progonović, Radoje, Milorad, and Domko Nikolić worked in Dubrovnik as the "bombers". Many historians write about these masters that they are from Dubrovnik, however, their origin and reality are different. There are still a lot of Ognjenovićs in Montenegro and Serbia. Progonovićs is mentioned in "Gorski vijenac" and it is a settlement in Montenegro. The

Nikolićs then lived from Popovo Polje to Nikšić (Zahumlje). Radoje and Milorad are Serbian names, not Dubrovnik, Latin. A bell was excavated near Čačak, which says that it was made in 1454 by the caster Radoje Milišić. It is obvious that this is the same Radoje who also worked in Dubrovnik as a foundryman. That Serbia had developed this activity is evidenced by the letter of Alfonso the Beautiful, King of Aragon and Naples, despot Djuradj Brankovic, in 1455, to send him 6 masters "... because it is known that you have excellent and experienced people to find and clean silver wires and gold ...".



Figure 2 *The younger Rhodope bell*

5 CONCLUSION

Exploitation and processing of polymetallic ores in the area of present-day Serbia has a centuries-old and even millennial tradition. The golden age of the mining and metallurgical activity in Serbia in the Middle Ages was in the 13th, 14th and the first half

of the 15th century. The production and processing of lead, copper, silver and gold decreased after the arrival of Turks, and finally stopped after the Austro-Turkish wars and the migration of Serbs at the end of the 17th and in the first half of the 18th century.

In Karadjordj's time, the renewal of mining began, especially at Rudnik, but only after the internal autonomy of the hatisherifs in 1830 and 1833, the conditions were created for the renewal of this activity.

With the formation of the Technical Faculty in 1863 and enactment the Mining Law in 1866, the conditions were created for the actual renewal of mining and metallurgical activities in Serbia.

Each country bases its development on its own natural potential. Mining and metallurgy have always been one of the key carriers of Serbia's development. When this activity was intense, strong, Serbia was also strong, and the development of this activity in the time of Nemanjić coincides with the development of the Serbian state.

The current mines of polymetallic ores of non-ferrous and precious metals are practically based on the medieval mines of these metals.

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