



S. V. Dyachkov

Trebuchets of the Genoese Fortress of Cembalo (XIV—XV centuries)



In XIV—XV centuries, the Cembalo colony was an important link of the transcontinental trade way the activity of which in Pontic Area was controlled by the Genoese Naval Republic. The Cembalo fortress provided the protection of Genoese interests in the North-West Crimea (fig. 1).

In 2005–2011 the joint expedition of Kharkov National University and National Park “the Chersonesos Tauride” conducted the excavations of defensive constructions of Consul’s Castle of Cembalo Genoese fortress in Balaklava (Sevastopol) [1; 2, c. 153–154]. The expedition studied the archaeological beddings of internal space of tower No. 8 located on the steep Northern slope of Kastron mountain (height — 57 m above the sea level) (fig. 2), and A, Б, B sites neighboring to the tower.

The results of excavations showed that in XIV—XV c. the tower was part of the complex of “the Consul’s Castle” fortifications. After the seizure of Cembalo by Ottoman Turks in 1475, tower No. 8 and the territory neighboring to it (A, Б, B sites) underwent reconstruction and

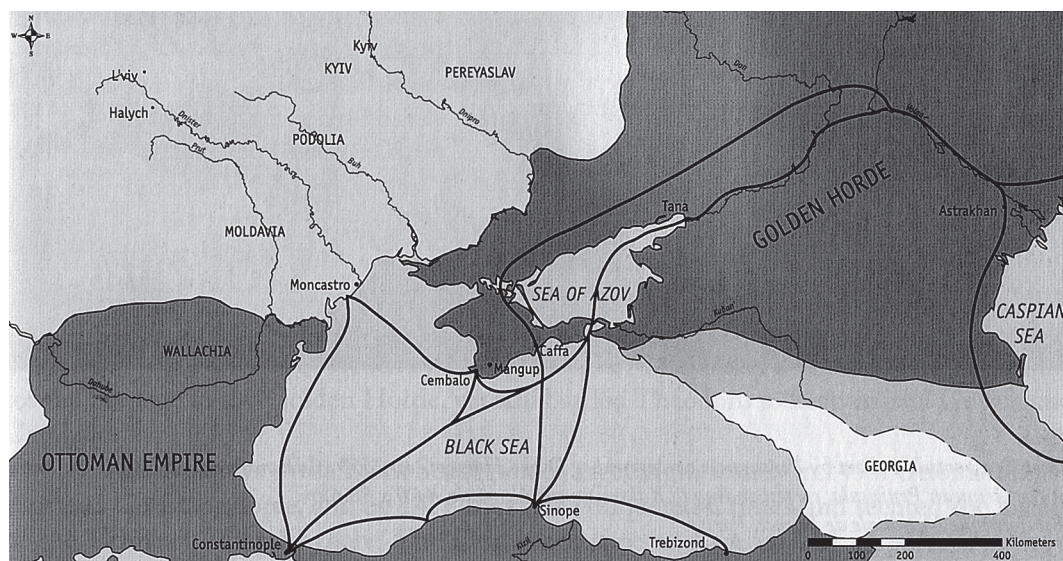


Fig. 1. Trade routes throughout the Black Sea in XIV—XV c. [27, p. 41]

Рис. 1. Торговые пути в Причерноморье XIV—XV вв. [27, p. 41]

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Fig. 2. Kastron mountain. Place of excavations. Western view
Рис. 2. Гора Кастрон. Участок раскопок. Вид с запада

were used for household needs. Thus, in the construction history of this fortress area two main construction periods are distinguished: “Genoese” (XIV—XV) and “Ottoman” (XV—XVII).

Curtain wall No. 6 is on sites Б and В that connected the towers closing the way to the castle from the North. On site В the remains of walls No. 7, 8 and 9 were discovered; they formed room No. 3 (about 25 m²). This room was constructed in “Ottoman” period in Cembalo history (end of XV—XVI). Here, traces of wooden supporting constructions were found, they indicate that this room was covered with a light shelter. The Turkish traveler of XVII c., Evlia Cheleby, mentioned, that small military settlements and other constructions [3, с. 70–73] were squeezed on the Northern slope of Kastron mountain. The main peculiarity of walls No. 7, 8 and 9 of room No. 3 was that they were laid mainly from stone balls (fig. 3). Behind the wall of room No. 3 a chaotic pile of stone balls (36 shots) was discovered, probably, they were moved here during the construction of the room No. 3 (fig. 4).

The area of room No. 3 was covered by a thick, well beaten floor of hardened clay. Near wall No. 8, two meters from the Eastern corner of room No. 3, a fireplace was constructed. It was of a rounded form about one meter in diameter and was covered with small and middle raw stone with the height up to 0.15 m above the floor level. The internal volume of the fireplace was filled with dense laid fragments of cast-iron cannon balls. The fragments of the balls were covered with the layer (2–3 cm thickness) of dense clay. This construction of the fireplace, perhaps, provided high heat emission. There are no doubts that room No. 3 was used for household needs in “Ottoman times”. It is also obvious, that room No. 3 was located on the site constructed near tower No. 8 as far back as in Genoese times (fig. 5).

208 stone shots (table 1) were discovered near tower No. 8 as a result of demounting of walls No. 7, 8 and 9 and excavations on sites Б and В. This impressive “armoury” was intended to be used in case of attack and siege of Cembalo fortress.

Stone balls for torsion-machines are rather often met [4, с. 341–358; 5, с. 157] on the territory of medieval relics. However, shots for powerful throwing machines of trebuchet type have been discovered for the first time in such quantity.

Throw shots from Cembalo (XIV—XV)
(“Consul’s Castle”, Tower № 8, sites Б & В)

No	Weight of shot (kg)	Form of shot	Diameter (cm)	Circle (cm)	Stone
1.	24,9	Sphere	27	86	Marble limestone
2.	56,7	Sphere	33,5	111	Marble limestone
3.	34,9	Ellipsis	34/28,5	100/84	Diorite
4.	28,5	Sphere, cut off the segment	27	89	Marble limestone
5.	23,5	Ellipsis	24,5	91/82	Marble limestone
6.	33,2	Sphere	28	99	Marble limestone
7.	36,8	Sphere, cut off the segment	32,5	102	Marble limestone
8.	30,1	Sphere, cut off the segment	28	91	Marble limestone
9.	29,2	Sphere	28	88	Marble limestone
10.	17,6	Sphere, cut off the segment	26	80	Marble limestone
11.	42,5	Sphere	32	102	Marble limestone
12.	22,8	Ellipsis	28/20	92/80	Marble limestone
13.	68,8	Ellipsis	43/32	121/101	Diorite
14.	47,2	Sphere	30	105	Marble limestone
15.	34,7	Sphere, cut off the segment	28	96	Marble limestone
16.	21	Sphere	26,5	85	Marble limestone
17.	18,6	Sphere	23	76	Marble limestone
18.	42,3	Sphere	31,5	102	Marble limestone
19.	35,5	Sphere	29	93	Marble limestone
20.	52,3	Sphere, cut off the segment	30	110	Marble limestone
21.	24,1	Sphere, cut off the segment	28,5	98	Marble limestone
22.	22,3	Sphere	25,5	82	Marble limestone
23.	31,2	Sphere	30	97	Marble limestone
24.	31,2	Sphere	26,5	93	Marble limestone
25.	30,6	Sphere, cut off the segment	28,5	93	Marble limestone
26.	12	Ellipsis	22/18,5	70/60	Marble limestone
27.	46,8	Sphere	32,5	104	Marble limestone
28.	26,1	Sphere	26	86	Marble limestone
29.	20,3	Sphere, half of shot	27	91	Marble limestone
30.	53,3	Sphere	34,5	110	Marble limestone
31.	28	Sphere	27	88	Marble limestone
32.	22,1	Sphere	24	81	Marble limestone
33.	25	Ellipsis	33/21,5	91/75	Marble limestone
34.	32,7	Sphere	30	96	Marble limestone
35.	24,4	Sphere	28	87	Marble limestone
36.	11,9	Ellipsis	29/14,5	73/61	Marble limestone
37.	20,6	Sphere, cut off the segment	26	81	Marble limestone

38.	28	Sphere, cut off the segment	28	89	Marble limestone
39.	39,7	Sphere, cut off the segment	31,5	100	Marble limestone
40.	24,5	Ellipsis	29/22	87/80	Marble limestone
41.	34,3	Ellipsis	31/24	98/86	Marble limestone
42.	38,5	Sphere	33	101	Marble limestone
43.	33,5	Sphere, cut off two segments	31,5	97	Marble limestone
44.	34,8	Ellipsis	32/22	97/88	Marble limestone
45.	20,6	Ellipsis	26/21	84/75	Marble limestone
46.	34,9	Sphere, cut off two segments	29	96	Marble limestone
47.	35,7	Sphere	39,5	93	Marble limestone
48.	15,7	Ellipsis	28/18	81/67	Marble limestone
49.	13,6	Ellipsis	29/16	79/57	Marble limestone
50.	22,6	Ellipsis	31/28,5	85/74	Marble limestone
51.	28,8	Sphere	27,5	86	Marble limestone
52.	21,8	Sphere	35	107	Marble limestone
53.	70,1	Sphere	37,5	120	Marble limestone
54.	43,8	Sphere, cut off two segments	38	102	Marble limestone
55.	35,7	Sphere	30,5	95	Marble limestone
56.	40,3	Ellipsis	34,5/28	104/91	Marble limestone
57.	10,2	Ellipsis	14,5/16	67/56	Marble limestone
58.	14,8	Ellipsis	26/18,5	77/65	Marble limestone
59.	31,4	Sphere	30,5	95	Limestone
60.	45,1	Sphere	31,5	102	Marble limestone
61.	51	Sphere, cut off the segment	36	112	Marble limestone
62.	34	Sphere	29	91	Marble limestone
63.	47	Sphere, cut off the segment	33	103	Marble limestone
64.	33,5	Sphere, cut off the segment	31	93	Marble limestone
65.	17,1	Ellipsis	26/17,5	80/68	Marble limestone
66.	31,2	Ellipsis	38/28	98/69	Marble limestone
67.	29,2	Sphere	31	100	Limestone
68.	29,6	Sphere, cut off the segment	31	97	Marble limestone
69.	41,3	Ellipsis	37/26	104/84	Diorite
70.	35,5	Sphere	30	112	Limestone
71.	22,9	Sphere	26,5	87	Marble limestone
72.	25,8	Sphere	27	98	Limestone
73.	17,6	Sphere, half off shot	34	108	Limestone
74.	31	Sphere	34,5	92	Marble limestone
75.	26	Sphere	28,5	88	Marble limestone
76.	28,7	Sphere, cut off the segment	30,5	99	Limestone
77.	31,3	Sphere, cut off two segments	29	94	Marble limestone
78.	32	Sphere	30	93	Diorite
79.	33,9	Sphere, cut off two segments	30	94	Marble limestone
80.	39,9	Sphere	30,5	113	Limestone
81.	61,2	Sphere	40	117	Marble limestone

82.	68,2	Sphere	39,5	126	Marble limestone
83.	62,6	Ellipsis	42,5/31	120/102	Diorite
84.	53	Sphere	38	122	Limestone
85.	21,3	Ellipsis	25/19	85/73	Marble limestone
86.	72,9	Sphere, cut off the segment	40	123	Marble limestone
87.	39,1	Sphere, cut off the segment	31	99	Marble limestone
88.	61,7	Sphere	34	108,5	Marble column drum
89.	60,6	Ellipsis	39/28	118/102	Diorite
90.	60,9	Ellipsis	39,5/34	118/102	Diorite
91.	12,8	Ellipsis	27/17	77/63	Marble limestone
92.	35,8	Sphere	30	94	Marble column drum
93.	71,9	Sphere	37,5	122	Marble limestone
94.	41	Ellipsis	36/30	106/93	Diorite
95.	14,5	Sphere, cut off the segments	26	82	Limestone
96.	55,7	Ellipsis	36/29	112/102	Diorite
97.	64,3	Sphere	36,5	110	Marble column drum
98.	16,3	Ellipsis	26/18	78/71	Marble limestone
99.	52,5	Ellipsis	40/31	115/93	Diorite
100.	67,6	Sphere	34,5	113	Marble column drum
101.	32,9	Sphere, cut off the segment	28	92	Marble limestone
102.	32,9	Sphere	31	92	Marble limestone
103.	49,9	Sphere, cut off the segment	36	109,5	Marble limestone
104.	39,6	Sphere	30	86	Marble limestone
105.	29,1	Sphere, cut off two segments	29	94	Marble limestone
106.	53,9	Sphere	33	107	Marble limestone
107.	33,8	Sphere, cut off two segments	29,5	94	Marble limestone
108.	34,8	Sphere, cut off two segments	28	95	Marble limestone
109.	10,3	Ellipsis	23	66	Marble limestone
110.	29,9	Sphere, cut off two segments	29,5	92	Marble limestone
111.	11,8	Ellipsis	29,5	77	Marble limestone
112.	16,7	Sphere	27	80	Marble limestone
113.	113	Ellipsis	19,5/15	60/53	Diorite
114.	40,1	Ellipsis	29,5/25	102/87	Diorite
115.	32,7	Sphere, cut off two segments	30/26	96	Marble limestone
116.	19,9	Sphere, cut off two segments	22/21	78/77	Marble limestone
117.	12,8	Ellipsis	23,5/18	74/60	Marble limestone
118.	29	Ellipsis	31/26	94/86	Marble limestone
119.	34,5	Sphere, cut off the segment	27	92	Marble limestone
120.	32	Sphere, cut off two segments	30	95	Marble limestone
121.	29,9	Sphere	26	88	Marble limestone
122.	46,4	Sphere, cut off two segments	36	112	Limestone
123.	33,4	Sphere, cut off two segments	29,5	93	Marble limestone
124.	33	Sphere	32	95	Marble limestone
125.	36,5	Sphere, cut off the segment	30,5	95	Marble limestone

126.	28,8	Sphere, cut off two segments	31,5	99	Limestone
127.	19,7	Sphere	28,5	95	Limestone
128.	53	Sphere, cut off two segments	33,5	107	Marble limestone
129.	29,9	Sphere, cut off two segments	31	93	Marble limestone
130.	68,6	Sphere, cut off two segments	39,5	122	Marble limestone
131.	63,8	Ellipsis	44,5/30	119/97	Diorite
132.	62	Sphere, cut off two segments	30	117	Marble limestone
133.	66,7	Sphere	38	119	Marble limestone
134.	35,5	Sphere	31	97	Marble limestone
135.	76,6	Sphere, cut off the segment	38	118	Marble limestone
136.	29,3	Sphere, cut off two segments	31	99	Limestone
137.	25,2	Sphere, cut off two segments	25	86	Marble limestone
138.	20,4	Ellipsis	28/21	84/74	Marble limestone
139.	22	Sphere, cut off the segment	25,5	80	Marble limestone
140.	29,1	Sphere, cut off two segments	28	89	Marble limestone
141.	11,9	Sphere	21,5	68	Marble limestone
142.	24,6	Sphere	27	87	Marble limestone
143.	50	Sphere	37/31,5	109/96	Diorite
144.	45	Sphere, cut off two segments	33,5	105	Marble limestone
145.	25,3	Sphere	30	97	Limestone
146.	27,7	Sphere, cut off two segments	28,5	89	Marble limestone
147.	59,6	Sphere	35,5	112	Marble limestone
148.	30,5	Sphere	32	98	Marble limestone
149.	24	Sphere	28	92	Limestone
150.	48	Sphere	33	103	Limestone
151.	23,1	Ellipsis	28,5/19	90/76	Marble limestone
152.	36,6	Sphere, cut off the segment	30	100	Marble limestone
153.	36,6	Sphere, cut off the segment	34	102	Marble limestone
154.	31,6	Sphere	32	102	Limestone
155.	42,8	Ellipsis	36,5/25	113/101	Marble limestone
156.	42,8	Sphere	32,5	103	Marble limestone
157.	26,4	Sphere	32/22,5	92/76	Marble limestone
158.	32	Sphere, cut off the segment	30,5	95	Marble limestone
159.	35,2	Sphere, cut off two segments	31	100	Marble limestone
160.	61	Sphere	43/25	124/106	Diorite
161.	43,5	Sphere, cut off the segment	35	113	Limestone
162.	41,6	Sphere	36/24	108/91	Diorite
163.	64,1	Sphere	36	114,5	Marble column drum
164.	59,3	Sphere, cut off the segment	37	117	Marble limestone
165.	69,1	Sphere	38,5	118	Marble limestone

166.	55,5	Ellipsis	42/26,5	120/95	Diorite
167.	69,2	Ellipsis	48/29	130/99	Diorite
168.	53,4	Sphere	35	109	Marble limestone
169.	50,8	Sphere	36	110	Marble limestone
170.	76,7	Sphere	38,5	123	Marble limestone
171.	48	Sphere, cut off the segments	33	107	Marble limestone
172.	40,5	Sphere, cut off the segment	30,5	111	Limestone
173.	35,1	Sphere, cut off the segment	30,5	97	Marble limestone
174.	15,7	Ellipsis	27,5/16	84/66	Marble limestone
175.	38	Sphere, cut off two segments	32,5	100	Marble limestone
176.	56,1	Sphere	31,5	103,5	Marble column drum
177.	50,2	Sphere, cut off the segment	33,5	109	Marble limestone
178.	56	Sphere, cut off the segment	34,5	111	Marble limestone
179.	51,5	Sphere	35,5	113	Diorite
180.	50,5	Sphere	39	113	Diorite
181.	29,3	Sphere	28,5	91	Marble limestone
182.	30,9	Sphere, cut off the segment	29,5	91	Marble limestone
183.	31,9	Ellipsis	30,5/23	95/84	Diorite
184.	21,7	Sphere, cut off the segment	30,5	92	Limestone
185.	35	Sphere	35	108	Marble limestone
186.	32,7	Sphere, cut off the segment	28,5	96	Marble limestone
187.	34	Sphere, cut off two segments	28	94	Marble limestone
188.	31	Sphere	31,5	91	Marble limestone
189.	22,3	Sphere	31	97	Marble limestone
190.	44,3	Sphere	33,5	109	Marble limestone
191.	37,7	Sphere	31,5	96	Diorite
192.	44,5	Sphere	33	103	Marble limestone
193.	16,5	Sphere	34	103	Limestone
194.	50,6	Ellipsis	40,5/25	116/91	Diorite
195.	57	Sphere, cut off two segments	35,5	115	Marble limestone
196.	74,4	Sphere	40	130	Marble limestone
197.	30,9	Sphere	30	92	Marble limestone
190.	36,1	Sphere	35	108	Limestone
190.	104,7	Sphere	42,5	140	Marble limestone
200.	5,7	Ellipsis	21/15,5	60/52	Diorite
201.	35,6	Sphere	24	94	Marble limestone
202.	32,6	Ellipsis	27/36	100/81	Diorite
203.	60,4	Sphere, cut off the segment	39	117	Marble limestone
204.	4,5	Sphere	17,5	55	Limestone
205.	20,6	Sphere	23	78	Marble column drum
206.	10	Sphere	33,5	96	Limestone
207.	32,8	Ellipsis	37,5/25	96	Marble limestone
208.	18,8	Ellipsis	34/16	91/65	Marble limestone



Fig. 3. Wall No. 8 and fireplace in the room No. 3
Рис. 3. Стена № 8 и очаг в помещении № 3



Fig. 4. Excavations on site Б
Рис. 4. Раскопки участка Б

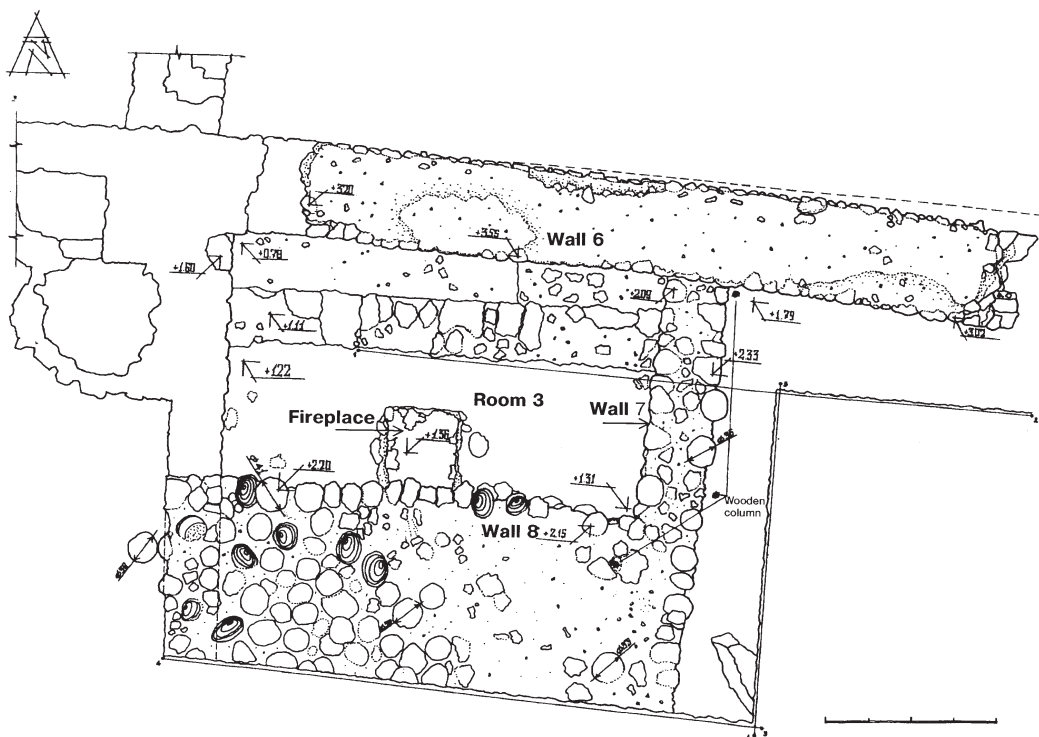


Fig. 5. Room No. 3 on the site for the trebuchet. Plan

Рис. 5. Помещение № 3 над площадкой для трембюше. План

The majority of shots had spherical form that was perfect for trebuchet shot on lofted trajectory. The very shots for throwing machines were used in medieval armies from France to China. The famous Chinese commander and officer of XI—XII c., Chan Guy, said in this connection “If shots have equal weight, then their blows on subjects will be accurate; if their form is spherical, they will fly at a long distance” [6, c. 154].

Shots made of local stone were the most numerous — the stone was the marble-like limestone of pink colour (Table 2). This incredibly solid stone takes processing rather badly. Stonecutters worked up the stone with small careless spalls creating a rough and spherical form (fig. 6, No. 38, 104, 199). Stone mining to made shots was, probably, done on-site. It is assumed that a stone quarry was in the saddle between the two peaks of Kastron mountain. The stone mined here was used for construction needs of the fortress [7, c. 37]. Some stones were smoothed by the sea and, perhaps, were delivered from the seashore.

Table 2

Throw shots from Cembalo (XIV—XV)

Stone	up to 20 kg	up to 30 kg	up to 40 kg	up to 50 kg	up to 60 kg	up to 70 kg	up to 80 kg	more than 100 kg	Total
Marble limestone	25	38	46	16	12	8	5	1	151
Diorite/“marine stone”	3		6	6	6	5			26
Limestone	6	8	6	3	1				24
Marble column drums		1	1		1	4			7
Total	34	47	59	25	20	17	5	1	208

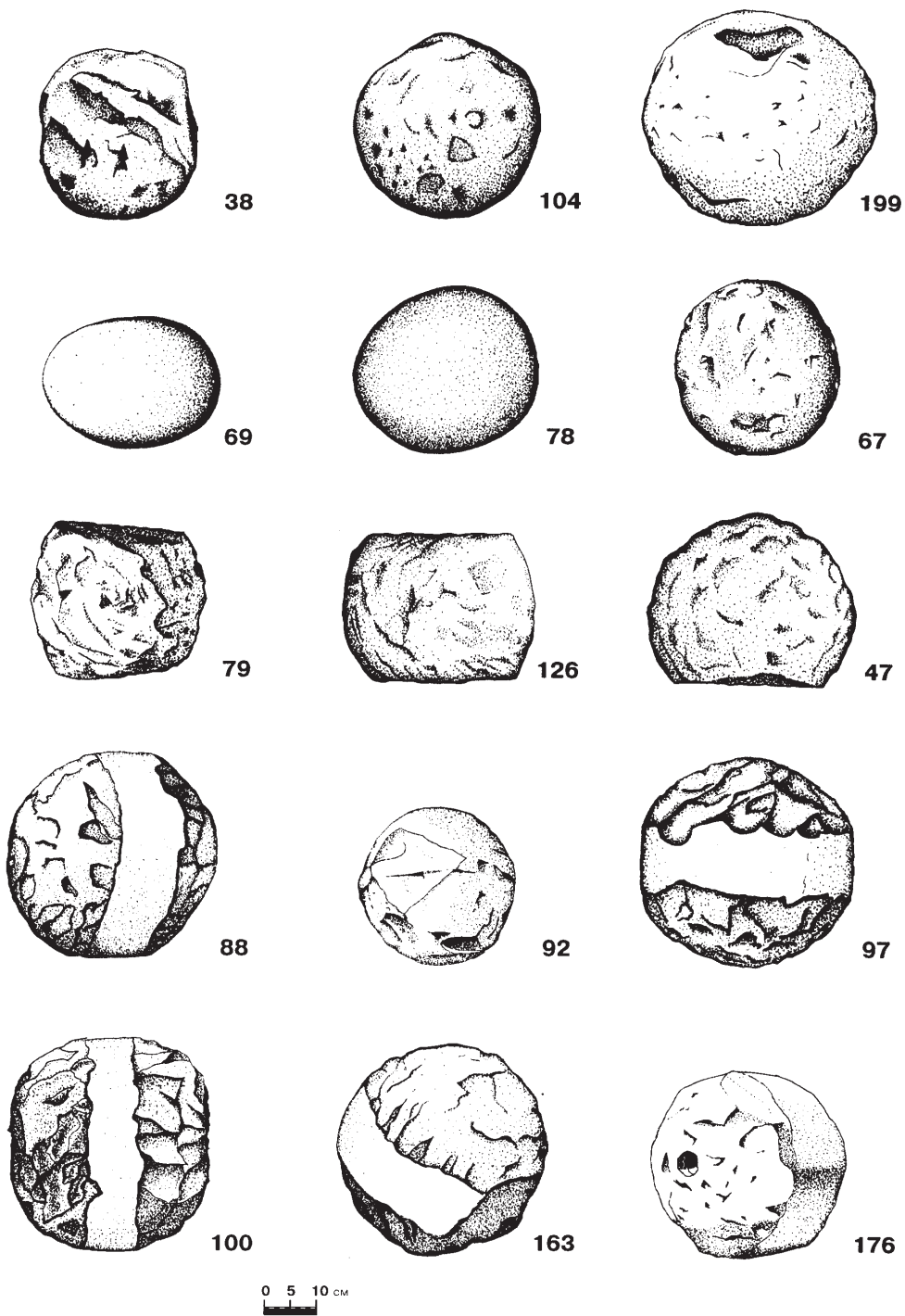


Fig. 6. The assort stone-bullets
 Рис. 6. Образцы каменных снарядов

“Marine stone”, diorite, was also used as a throwing bullet because it was perfectly smoothed and polished by the sea (Tables 1, 2). The majority of stone-bullets from diorite is ellipse-like or spherical and was not additionally processed (fig. 6, No. 69, 78). Marine stones as bullets were widely used in throwing artillery. For example, marine stones from Sicily were used by Normans during their attack on Alexandria in 1174 and the king of England, Richard Lion-Hearted, during the siege of Acre in 1191 [8, pp. 93, 97]. Apparently, stone transportation at such big distances proved its value. The diorite stones that were discovered in Cembalo are well known by stone beaches of Eastern Crimea (site of Soldayya and Kafa). However, possibly these stones were used by Genoese navigators as a ballast. After the complete shipment in Cembalo, the ballast stone was left in the port and a new application was found for it.

The balls made of white limestone (table 1) have a regular spherical shape. This stone is sometimes called “Inkerman” (fig. 6, No. 67). Generally, deposits of silt limestone on Heraclian peninsula have been well known since ancient times. This stone was used everywhere in the construction of ancient and medieval cities and settlements. Limestone balls are well processed, the surface of the stone was smoothed, and many shots still have tracks of boaster.

Bullets cut out of marble column drums are of peculiar interest. Dressing of the column drum was done from flat sides, thus, the polished rings of columns have remained untouched by a stonemason that allowed to determine rather accurately their diameter (table 1). Seven bullets are cut out of columns made of coarse gray marble (No. 88, 92, 97, 100, 163, 176, 205). Ball No. 88 was made of segment of marble column of yellowish shade and differs visibly from the other marble balls for the stone structure. It can't be excepted that Genoese people used ruins of ancient or early Byzantine period big construction that was not far away (probably, instead of modern Balaklava). Here they mined stones from marble and limestone.

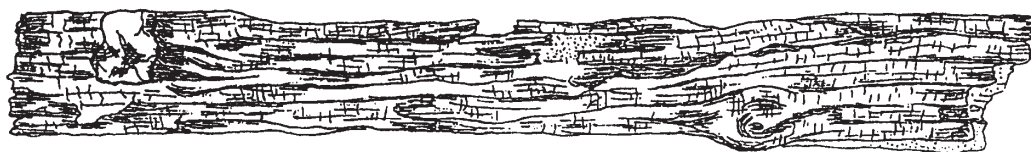
The total weight of charge bullets exceeded 7.7 tones. Bullets with the weight from 20 to 70 kg and mainly 0.25–0.40 m in diameter (table 2) prevail in terms of quantity. According to the studies in many countries, the balls of such dimensions were the most effective for trebuchet installed on defensive walls. The weight of such bullets allowed to harm the enemy, but at the same time they could be lifted by one person [8, p. 94; 9, c. 76; 10, c. 275; 11, p. 18–20]. A notable exception is ball No. 199 made of marble-like limestone the weight of which was 104.7 kg. The bullets of such weight were usually used by heavy trebuchets to destroy fortress walls [8, p. 84; 12, VI.1, c. 176]. However, while defending Chernihiv from Batyj army, prince Mstyslav in 1239 used bullets that could have been lifted by four strong men [13, c. 114].

The bullets, apparently, were moved many times. They have damages on their surface, many spalls, and burning trails. More than 20 charge bullets remained in large fragments. It must be emphasized that 65 % of the bullets had the form of truncated sphere or drum. A stonemason cut out one or two planes (fig. 6, No. 79, 126, 47). Probably, such “upgrading” of the bullet was due to the ball location in a sling bag and movement towards the directing chute of the throwing machine.

Burning traces at the bottom of the layer No. 4 are found everywhere on B site. The thickness of the burning layer is 1.5–2.5 sm. Perhaps, Genoese people burnt the trebuchet abandoning the fortress in 1475 so that this expensive machine would not get into the hands of enemies.

More than 40 big iron “construction” nails (0.07–0.14 m) were found on site B beside the bullets. A big segment of wooden construction of the trebuchet was found at the bottom of the curtain wall: a board (1.67 × 0.21 m) and a bar vertically fixed to it with a side of 0.15 m. The segment of the construction did not burn because it was deepened into the ground (fig. 7).

Sizes of the site for installation of the stone-throwing machine made 5.65 × 5.05 m. The site was constructed on a steep slope of the mountain from the internal side of the curtain wall to the East from the tower No. 8 (fig. 8). A considerable part of the rock was removed



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Fig. 7. Wooden fragment construction of trebuchet
Рис. 7. Деревянный фрагмент конструкции требюше

(cut out) to construct a horizontal surface of the site. Big raw stones ($0.45 \times 0.4 \times 0.5$; $0.25 \times 0.4 \times 0.55$ m, and etc.), appeared as a result of rock split, were destroyed at the base of the site, on the flank of the hill. Maximal thickness of the site base made 0,75 m. Practically half of the site base was made from splitted rock. The rest part of the site base along the flank of the hill was filled with raw stone and broken bricks. The whole site surface was covered with the layer of green clay (0.05–0.08 m). The Genoese people used local green clay in Cembalo as leveling, water proofing and jointing material. In Ottaman period of Cembalo history the local inhabitants used this flat, regular shape site that remained after the trebuchet burning to construct household rooms. Few crushed segments of ceramics were found during excavations, mainly of XIV c.

In 2007–2008 during the excavations there were discovered a well-equipped and painstakingly built platform (larger than 25 m^2) meant for installation of a powerful stone throwing machine the remains of iron lamellar armour. The discovered plates of the armour and their parts in their shape are most probably related to the same kind of defensive armour [14].

It should be emphasized that Genoese people did not construct the site for the throwing machine against a defensive wall. The point is that at the moment of a “shot” the trebuchet was shaken heavily. For example, a big trebuchet, that was used by Normans in 1185 during the attack of Thessalonica, they called “Daughter of earthquake” [8, p. 94]. Therefore, trench channel was made between the base of the site of the trebuchet and low rows of curtain wall laying, and it was filled with dry ground and small stones ($5.05 \times 0.55 \times 0.75$ m). This trench channel served as an antivibration cushion (fig. 8).

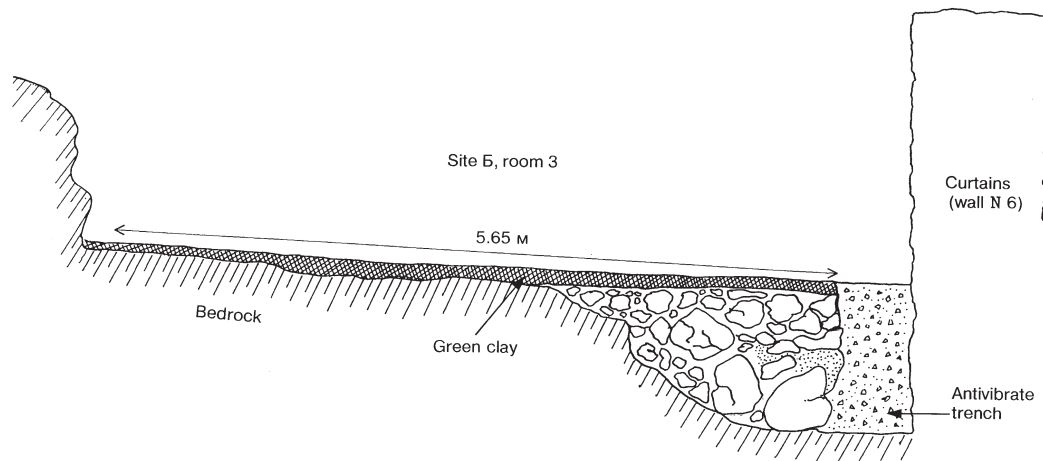


Fig. 8. Site for trebuchet. Stratification
Рис. 8. Площадка для установки требюше. Разрез

The results of excavations allow to assume that a counterbalanced trebuchet was installed near tower No. 8 of the defensive system of Cembalo Consul's Castle. It is known that as far as in XIV c. the Genoese people constructed big navi ships on a local shipyard [15, c. 10, ASG AS 3021 DF 1, № 60/85]. Thus, the colony had necessary technical, raw and human resources to make the trebuchet.

Tower № 6 is in the port area of the town. A huge cistern for keeping more than 550 m³ of water was placed on the lower layer of the Tower. More 20 stone shots were discovered into Tower No. 6. The upper layer was used as a battle ground (80 m²) for setting missile machines (fig. 9) [2, c. 154–155].

The counterbalanced stone-throwing machines occupy special place in medieval throwing artillery. Machines of this type were widely used in Europe and Asia until the middle of XV c. For example, during the attack of Constantinople by Ottaman people in 1453, the fighting parties used the trebuchets together with gunshot artillery [16, c. 77, 88, 90]. There are evidences about the use of trebuchet in XVI and even XVIII c. [17, p. 65].

According to the opinion of specialists, the advantages of the trebuchet were: high accuracy and density in shooting with bullets of 20–90 kg weight. At the same time, the usual distance of "shot" was about 130–200 m [8, p. 72; 9, c. 76; 10, c. 275]. The defenders of medieval fortresses used throwing machines, first of all, to destroy the siege constructions of the enemy. Modern reconstructions show that big trebuchets were capable to send bullets rather accurately to the target with size of 5 × 5 m [18, p. 189–268]. The fortress trebuchets were installed on special sites or on towers of fortress constructions [6, c. 243; 18, fig. 4; 19, c. 28; 20, p. 6]. For example, S. Ransymer testifies that it could have been possible to shoot with heavy balls and throw stones from curtain walls and towers of the external wall of Constantinople [16, c. 88].

The trebuchet construction allowed to throw big raw stones, millstones, gravestones and even animals. Throwing of heads of executed enemies was of great psychological effect. In the Middle Ages this method was often used in Europe and Asia [6, c. 155; 8, p. 84; 11, p. 20]. In particular, during Cyprus regaining in X c., Byzantine strategist ordered to fire at Arabic garrison of the city with cut-off heads of their tribesmen [21, I.8, c. 12]. In 1346 when Kafa was under siege by troops of the Golden Horde of khan Janibeg, the corpses of people who had died from plague were thrown to the city. The attempt of Genoese people to escape brought "Black death" to Europe. In some countries plague reduced the number of population to one third [22, c. 335; 23, p. 123].

The trebuchet installed on the Northern slope of the hill of the Consul's Castle of Cembalo fortress was for the fight with enemy ships (fig. 10). The use of throwing machines against ships and installation of trebuchet on ships is a well known fact in the history of siege cause in the Middle Ages [8, p. 81]. Robert de Clary described in details the artillery duel between the ships of crusaders and defenders of Constantinople in 1204. Both sides used throwing machines of trebuchet type [24, c. 51–53].

The Cembalo trebuchet was capable to deliver stone balls of four calibers at distance of 150–250 m covering, thereby, the narrow entrance to the bay. Here, ships had to slow down (the speed) and to fulfill complicated maneuvers. The trebuchet was installed on the height of 57 meters above the sea level. The height of the lofted trajectory of a 50-kilogramme shot was 60–80 m. Such a bullet had, certainly, and enormous destructive force capable to destroy an enemy ship (fig. 10). Near the trebuchet, probably, a necessary stock of throwing bullets was located. It should be mentioned that bullets of different weight were in the armoury of trebuchet of Cembalo fortress. Perhaps, in some cases, 2–3 bullets were put together into a sling bag of trebuchet. Thus, "volley" came out and this increased the probability of direct hit into the target. The thorough study of the bay base in this place allowed to discover only three shots. They have appeared here as a result of fire-fight.



Fig. 9. Fragment of battle ground for setting missile machines. Tower No. 6. Western view
Рис. 9. Фрагмент боевой площадки для установки метательных машин. Башня № 6. Вид с запада

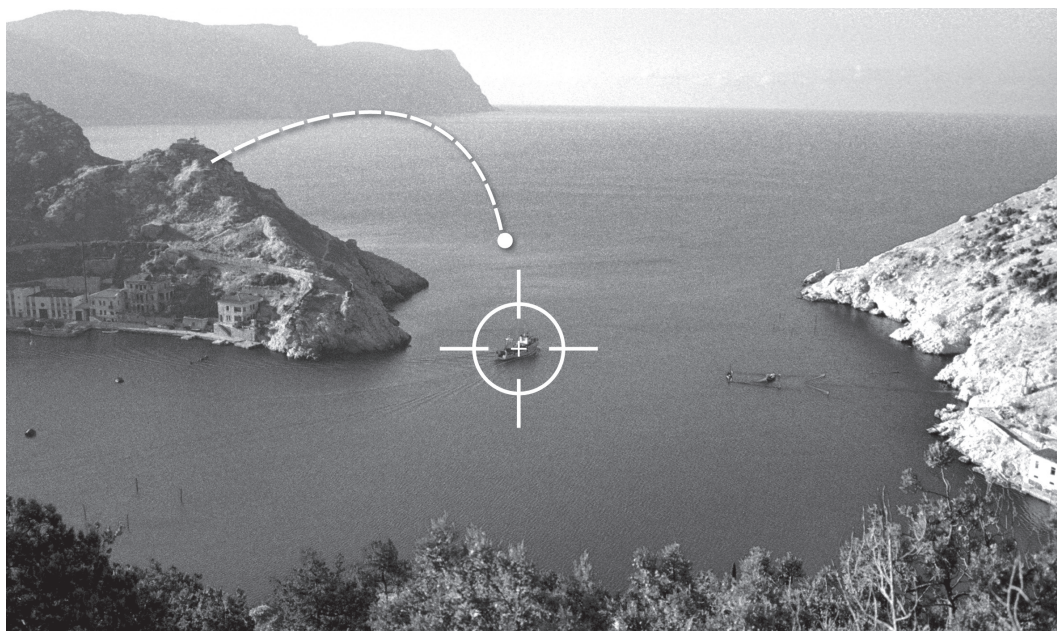


Fig. 10. Action of the throwing machine (reconstruction)

Рис. 10. Предполагаемое действие метательной машины (реконструкция)

As it is known, in 1433, due to the revolt of local inhabitants, Cembalo occurred in the fortress was in hands of prince Theodoro [25, с. 156–158]. In 1434, the rapid attack of warships allowed Genoese people to burst into the fortress and to restore their power over Cembalo [26, с. 116–117]. Genoese people may have reinforced the fortress after these dramatic events by installing here a throwing machine of trebuchet type. However, trebuchets and other means of defense could not hold the Turkish onslaught in 1475 when Ottoman occupied the Genoese property in the Crimea.

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Резюме

Д'ячков С. В. Камнемёты (типу Trebusbet) генуезької фортеці Чембало (XIV—XV ст.)

Об'єднана експедиція Харківського національного університету імені В. Н. Каразіна і Національного заповідника «Херсонес Таврійський» у 2000–2011 рр. проводила дослідження оборонних споруд генуезької фортеці Чембало в Балаклаві (Крим, Україна). Під час розкопок ділянки башти № 8 знайдено 208 кам'яних снарядів сферичної форми для великої металеної машини типу трєбуше. Для виготовлення ядер використовували місцевий мармуроподібний вапняк, вапняк, діорит (морський камінь), а також барабани мармурових колон, очевидно, античного або візантійського часу. Переважали снаряди вагою 20–70 кг й діаметром 25–40 см. Загальна вага «арсеналу» перебільшила 7,7 тони.

Трєбуше призначувалася для боротьби із кораблями противника. Матеріали розкопок показують, що верхній ярус башти № 6 (80 м²) використовували у якості бойового майданчика для встановлення металених машин, зокрема трєбуше. Ці металені машини контролювали внутрішню акваторію бухти. Використання трєбуше для активної оборони фортеці свідчить про високий рівень фортифікації Чембало.

Ключові слова: Генуезька фортеця Чембало, фортифікація, башти, трєбуше, металені снаряди.

Резюме

Д'ячков С. В. Камнемёты (типу Trebusbet) генуезской крепости Чембало (XIV—XV вв.)

Объединенная экспедиция Харьковского национального университета имени В. Н. Каразина и Национального заповедника «Херсонес Таврический» в 2005–2011 гг. проводила исследования оборонительных сооружений генуезской крепости

Чембало в Балаклаве (Крым, Украина). В результате раскопок участка башни № 8 обнаружено 208 каменных снарядов сферической формы для большой метательной машины типа требюше. Для изготовления ядер использовали местный мраморовидный известняк, известняк, диорит (морской камень) и барабаны мраморных колонн, вероятно, античного или византийского времени. Преобладали снаряды весом 20–70 кг и диаметром 25–40 см. Общий вес «арсенала» превысил 7,7 тонн.

Требюше предназначалось для борьбы с кораблями противника. Материалы раскопок показывают, что верхний ярус башни № 6 (80 кв. м) использовался в качестве боевой площадки и установки метательных машин, в т. ч. требюше. Эти метательные машины контролировали внутреннюю акваторию бухты. Использование требюше для активной обороны крепости свидетельствует о высоком уровне фортификации Чембало.

Ключевые слова: Генуэзская крепость Чембало, фортификация, башни, требюше, метательные снаряды.

Summary

S. Dyachkov. Trebuchets of the Genoese Fortress of Cembalo (XIV—XV centuries)

In 2005–2011, a joint expedition of Kharkov National University named after V. N. Karazin and National Park “the Chersonesos Tauride” conducted excavation of defensive constructions of Cembalo Genoese fortress in Balaklava (the Crimea, Ukraine). As a result of excavation, there were discovered 208 stone shots of spherical form which were intended for a powerful throwing machine of trebuchet type. Shots were made of local marble-like limestone, chalkstone, diorite (“marine stone”) and marble column drums, probably, of antique or early Byzantine period. Bullets weighing from 20 to 70 kilograms prevailed. Total weight of charge of the “armory” exceeded 7.7 tonnes.

The trebuchet was used to fight against enemy ships. The results of excavation indicate that the upper storey of the Tower 6 (80 m²) was used as a battle ground for mounting throwing machines, including trebuchets. The throwing machines were utilized to control the inner water area of the bay. The fact that trebuchets were used for aggressive defense proves the high fortification level of Cembalo.

Key words: Genoese Fortress of Cembalo, fortification, towers, trebuchet, missiles.

