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CONTRIBUTIONS TO THE STUDY OF THE ALLOY STANDARDS OF THE HUNGARIAN GOLD COINS STRUCK DURING THE ANGEVIN PERIOD

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Introduction

Hungarian gold coinage was introduced by Charles I of Anjou during the second decade of the 14th century. The first mention of Hungarian florin is known from the testament of the bishop of Olomouc dated 1325[1]. Since that time Hungarian florin became a well known and respected currency in the European monetary circulation. This topic, due to its international role, became a special and a well favored field in the numismatic research of the last hundred years. Investigations specified its main types, their relative and absolute chronology and took a survey of its spreading around all over Europe regarding coin hoards and written sources. It seemed with that all aspects of Hungarian medieval gold coinage made clear, controversial questions are solved.

In spite of the long lasting researches, the question of the alloy standards of the Hungarian medieval gold coins was not clearly solved. There remained only two contemporary domestic written sources regarding its standard, namely the leasing contracts of two mint chambers from the years of 1335 and 1336. Due to the contracts Hungarian gold coins should be struck patterned after the Florentine fiorino d'oro, but a little bit heavier[2]. Trustworthy authentic sources regarding its standard are known only from the 16th century. That time 69 pieces were struck of one 23 carats 9 grains fine (989.6‰) from a mark of Buda (245.53779 g)[3]. From that time its mentions are continuous and the same, numismatists and economic historians as well reflected this fineness back to the former periods, presumed that its quality remained all the same during centuries. As it will be seen below that was not always absolutely correct.

The results of elemental analysis

During 1997-1999 an opportunity had arisen to make some elemental analysis of Hungarian medieval coins, with the financial assistance supported by the OTKA (Hungarian Scientific Research Fund). During this project, the method of the dispersive energy X-ray fluorescence was used to determine elemental composition of coins from the Arpadian period in a fast and nondestructive way[4]. Beside the silver pence from the 11th century, two pieces of gold coins assigned to Stephen I, some Byzantine solidi and gold jewels from the age of the Hungarian conquest, all of the gold florins from the Angevin period of the Hungarian National Museum's collection were analyzed by the above mentioned method[5]. The analyses were undergone in two ways - the qualitative and quantitative one. The quantitative method can indicate in the case of gold coins their three main components, namely the proportion of gold, silver and copper in the alloy. The measurement time in the case of this method was 300 seconds (five minutes) for each sample. The

[1] „de nonaginta aureis monete regis Ungarie", cf. B. Hóman, *Magyar pénztörténet*, Budapest, 1916, p. 407.

[2] „florenus ad modum florenorum Florencie, de fino auro, sed aliquantulum ponderaciones", *Decreta Regni Hungariae 1301-1457*, Budapest, 1976, p. 86, no 91.

[3] Concerning the sources of the Hungarian florin see: O. Paulinyi, *A magyar aranymonopólium jövedelme a középkorban*, in: *Emlékkönyv Domanovszky Sándor születése hatvanadik fordulójának ünnepére*, 1937. május 27. Budapest, 1937, p. 493, footnote no 9; B. Hóman, *op. cit.*, pp. 98-99; Idem, *Károly Róbert pénzügyei és gazdaságpolitikája*, Budapest, 1921, pp. 85-86; L. Huszár, *A budai pénzverés története a középkorban*, Budapest, 1958, p. 32; P. Engel, *A 14. századi magyar pénztörténet néhány kérdése*, Századok, 124, 1990, 1, p. 43.

[4] OTKA no T020923, the project-manager was István Gedai. The researches were undergone in the Institute for Chemical Technology of the Technical University in Budapest, with the assistance of Zsuzsanna Sándor, Iván Gresits and László Járosi.

[5] For the preliminary results of the project see: C. Tóth, *Az Árpád-kori pénzek ötvözőelemeinek vizsgálata*, Numizmatikai Közlöny, 102-103, 2003-2004, pp. 35-44.

qualitative analysis lasted 50,000 seconds (nearly 14 hours) each, but beside the main components (e.g. gold, silver, copper), it was possible to reveal the presence of scandium, titanium, vanadium, chromium, manganese, iron, cobalt, nickel, zirconium, niobium, molybdenum, technetium, ruthenium, rhodium, palladium, cadmium and indium.

So far, a quite impressive sample of 141 Hungarian gold coins struck during the 1330-1380's was analyzed by quantitative way:

1. Charles I - 16 specimens.
2. Louis I - 81 specimens.
3. Mary - 44 specimens.

By the qualitative method was analyzed a number of 54 Hungarian gold coins meaning about one third of the sample:

1. Charles I - 16 specimens
2. Louis I - 30 specimens
3. Mary - 9 specimens[6].

The quantitative analysis of gold coins partly confirmed the previous information, which was based on the 16th century written sources, but partly yielded significantly new results. The average fineness of Charles's gold coins is 994‰. The threshold limits are 997‰ and 990‰. The medium finesse of 994‰ is not only in accordance with the 23 3/4 carats (989‰) standard mentioned by the contemporary written sources but even exceeds that. Analysis resulted lower fineness only in three cases (accordingly: 989‰, 986‰, 986‰), but the weights of the concerned coins are also lower. Due to their barbarized style these specimens seem to be not genuine official issues but contemporary forgeries. The gold coins of Mary have even higher fineness compared to those of Charles I, their average fineness being 997‰. Their gold content is uniformly high and there is not any known specimen to be under 994‰. On the contrary, the gold content of the florins of Louis I display great dispersion of the values of the gold contain, so his various types must be examined separately. The average fineness of his first, Florentine type gold coin (Huszár 512) is „only" 990‰. I must emphasize that the measured values are much more dispersed, being between 996‰-986‰. The same patterns are continued by the next type (Huszár 513). Its average fineness is 987‰. The figures are ranging from 993‰ to 977‰, so it is a little bit under the 23 3/4 carats standard. The lowest gold content was found in his last main coin type, bearing the image of St. Ladislaus on the reverse (Huszár 514-518)[7].

According to the traditional chronological order, among the florins with St. Ladislaus, the earliest were the Huszár 514-515 types. Their average fineness is 984‰, but it is very conspicuous, that there are spectacular differences among the specimens bearing various mint-marks. The gold contents of (980‰ and 987‰) the pieces with mint-mark **P** and the **star** (Pohl B4-1, B4-5)[8] is lower, meanwhile the specimen with a mint-mark **crown** (Pohl B4-3) is higher (994‰). In the case of the coins with the mint-mark **FB**, those specimens which **have no lily flowers**, or **only two lilies** (Pohl B4-7,8) have a higher fineness (993‰), than those having in the mint-mark **six lilies** (Pohl B4-10), which are only of 983‰. The same connections can be stated in the case of the specimens with mint-marks with the **Saracen-head**. So, the coins with the mint-mark **Saracen head without or with two lilies** (Pohl B4-11,12) has higher gold content (994‰), while the ones where the mint-mark contains **five, seven or eight lilies** (Pohl B4-13,14,15), fineness is 979‰. The gold content of type Huszár 515, where the **Saracen head** and the **FB** mint-marks are both combined with **five lilies** (Pohl B5-1,2), the average finesse is low (982‰). It seems to me that a kind of negative correlation can be realized relating the number of the – so called **lilies mint-mark** and the gold content of the coins. While the mint mark is without any lily or with only two lilies, fineness is higher than florins with

[6] The results of the qualitative analysis were previously published by I. Gedai, *Szent István aranypénzverése*, Budapest, 1999, pp. 45-46.
[7] L. Huszár Lajos, *Münzkatalog Ungarn von 1000 bis heute*, Budapest-München, 1979.
[8] A. Pohl, *Ungarische Goldgulden des Mittelalters (1325-1540)*, Graz, 1974.

five or more lilies, which have a more reduced gold contain. There is only one exception, the above mentioned piece with the mint-mark **crown** and **eight lilies**. Unfortunately there are not any coins known with one, three our four lilies, so it can not be decided when the reduction started. We should mention that the very rare type with mint-mark **P-G** (Pohl B3) has also low fineness. The last gold coin types of Louis I (Huszár 516-517) have a very high gold content again, their average fineness being 994‰ and 992‰.

Summing up the above mentioned results in the light of the elemental analysis, it is rather clear that the gold issues of the three Angevin rulers have not the same fineness standards. Despite the fact that there could be some anomalies of the analysis, comparing them face-to-face, the difference is significant. Florins of Charles I and Mary had a very high gold content, so they are nominally pure gold, but the types struck under Louis have lower fineness.

This kind of decline or reduction of fineness started with the introduction of the new, specifically Hungarian type, with the image of St. Ladislaus on the reverse, but it is not uniform. The coins with different mint-marks have various fineness. The few per cents reduction means half or more carats, which is significant amount even during the Middle Ages. The question is whether there is any contemporary document, rate of exchange etc., that indicates a reduction of the Hungarian florin during the reign of Louis I.

Contemporary western European written sources

Just a couple of months ago Ernest Oberländer-Târnoveanu, head of Coin Department of the Romanian National Museum in Bucharest has published a lot of contemporary western European written sources regarding Hungarian medieval gold coinage.[9] There are interesting data are in the 14th century Italian merchant's and account books. In this kind of sources Hungarian gold coins are frequently mentioned, usually compared to the Florentine florins and the Venetian ducats. Beside its usual mentions (fiorini ungheri = Hungarian florins) sometimes the sources contain few indication to their specific design. The sources make a very clear difference (due to their value) not just between the issues of Charles I and Louis I, but even the two main gold types of Louis I. Let's see some examples:

„Fiorini ungheri del Giglio sono di carati 23 e tre quarti"

Hungarian florins with lily are of 23 ¾ carats.

„Fiorini ungheri di Mannaia, e scudi, sonno di carati 23 e un quarto"

Hungarian florins with battle axe and coat of arms are of 23 ¼ carats

„Unghere della manaia e dello scudo sono di ca. 23 1/4, e quelli del giglio di ca. 23 3/4"

Hungarian [florins] with axe and coat of arms are of 23 ¼ carats, and those with lily are 23 ¾ carats[10].

According to the sources, those Hungarian florins, on which is represented the lily flower, are half carat better, than those with "the battle axe" (e.g. St. Ladislaus) and coats of arms. It is easy to identify the first one with the florins struck by Charles I (and, of course, by Louis I) (Huszár 440 and 512), which bear a lily flower on the obverse. The second reference regards likely the gold coins of Louis I, with the representation of the coat of arms on the obverse and standing St. Ladislaus figure, holding an battle axe on the reverse (Huszár 513-516). In this case the „axe" means „pars pro toto" the Hungarian saint, proven by another sentence in the source: „Fiorini d'Ongaria, ... da l'altra parte santo Ladussalus con una mannaia in mano..." = "Hungarian florins..., ont he other side is St. Ladislaus with an battle axe in his hand." Such a kind of reduction of gold coins could not pass unnoticed among the Italian merchants...

[9] E. Oberländer-Târnoveanu, *A 13-16. századi magyar pénzverés emlékei nyugaton I. Korabeli itáliai, francia és katalán források*, Numizmatikai Közlöny, 102-103, 2003-2004, pp. 45-56.
[10] *Ibidem*, pp 46-50.

Conclusions

In the light of the latest researches we should revise our conception on the unified standard of Hungarian gold coins of the Angevin period. The elemental analysis and the contemporary written sources both indicate that the new Hungarian florin type with the figure of St. Ladislaus on the reverse, introduced by Louis I during the second half of his reign, had a fineness standard half carat lower than of those of Charles I and Louis I's first types. Analyses just shade off this result, that there are differences between coins with various mint-marks, although the known contemporary sources made no any differences, and labeled them „en block" as being worst. It is very peculiar, that due to the analysis, that in the case of last florin types of Louis I the former good quality was re-established.

We do not know anything about the background of the reduction of Hungarian gold coins, but it is evident, that it was connected with the changing of the design. Such a reduction of fineness would never be a secret in the life of merchants and money changers, so it appeared in the written sources apparently. These kind of manipulations did not strengthen the reputation of Hungarian florins, so it could be the cause, that Louis I came back to the higher fineness, which could be pointed out on the florins of Mary as well.

Last but not least, we should mention some older researches, which indicate that some alterations in the standard of the Hungarian florins, smaller ones of course, happened not only during the Angevin period. Carl Schalk made elemental analysis on Hungarian gold coins during the 19th century. On that occasion he found that fineness of florins of Sigismund (coin no 981), Vladislav I (coin no 984) and Matthias Corvinus (coin no 982) was, so less than 23 3/4 carats[11]. The account books of the chamber of Körmöcbánya from the year of 1434-1435, (the researches of Oszkár Paulinyi), indicates that florins of Sigismund were struck of a gold alloy of 23 ½ carats[12]. A source from Catalonia says that Hungarian florins with St. Ladislaus are of carats 22. This source can be dated to the beginning of the 15th century, so it regards to florins of Sigismund as well[13].

Appendix

No.	Huszár	Pohl	Inv. no.:	Au (%)	Ag (%)	Cu (%)	Weight
1.	440	A1	125/1892-1	99,19	0,71	0,1	3,59 g
2.	440	A1	68/885	99,71	0,19	0,1	3,56 g
3.	440	A1	Jank.366	99,775	0,125	0,1	3,52 g
4.	440	A1	15/896-4	99,08	0,82	0,1	3,54 g
5.	440	A1	57/943	99,67	0,23	0,1	3,54 g
6.	440	A1	Wesz.24/a	99,44	0,46	0,1	3,55 g
7.	440	A1	Sz.I.62.1	99,69	0,21	0,1	3,44 g
8.	440	A1	6B/909	99,2	0,7	0,1	3,53 g
9.	440	A1	40/893-1	99,66	0,24	0,1	3,57 g
10.	440	A1	44/884-1	99,4	0,5	0,1	3,55 g
11.	440	A1	Wesz. 24/b	99,71	0,17	0,1	3,52 g
12.	440	A1	167/873-3	99,72	0,18	0,1	3,46 g
13.	440	A1	Wesz.24/c	99,71	0,19	0,1	3,49 g
14.	440	A1	Wesz.24/f	98,93	0,5	0,47	3,22 g
15.	440	A1	Wesz.24/g	98,66	0,7	0,54	3,21 g
16.	440	A1	69/1973	98,69	0,18	1,03	3,25 g

[11] C. Schalk, *Der Münzfuss der Wiener Pfennige in den Jahren 1424 bis 1480*, Numismatische Zeitschrift, 12, 1880, p. 94.
[12] O. Paulinyi, *A körmöcbányai kamara 1434-1435. évi számadása /Műhelybeszámoló/*, A Magyar Numizmatikai Társulat Évkönyve, 1972, 1973, pp. 79-94.
[13] E. Oberländer-Târnoveanu, *op. cit.*, p. 51.

No.	Huszár	Pohl	Inv. no.:	Au (%)	Ag (%)	Cu (%)	Weight
17.	512	B1	Jank.367	99,33	0,57	0,1	3,53 g
18.	512	B1	Sz.I.67.1	98,91	0,99	0,1	3,53 g
19.	512	B1	1B/904-5	99,05	0,85	0,1	3,50 g
20.	512	B1	Sz.I.68.2	99,18	0,72	0,1	3,55 g
21.	512	B1	10B/909-1	99,49	0,41	0,1	3,46 g
22.	512	B1	32B/917-1	98,97	0,93	0,1	3,53 g
23.	512	B1	Jank.368	99,12	0,78	0,1	3,56 g
24.	512	B1	Dess.423	99,16	0,74	0,1	3,56 g
25.	512	B1	Jank.32	98,7	1,2	0,1	3,56 g
26.	512	B1	122/892-1	99,63	0,27	0,1	3,49 g
27.	512	B1	118/892	98,69	0,21	0,1	3,49 g
28.	513	B2	63/893-1	99,03	0,87	0,1	3,56 g
29.	513	B2	Jank.370	99,32	0,58	0,1	3,57 g
30.	513	B2	Jank.460	97,7	2	0,3	3,57 g
31.	513	B2	50B/904-1	99,01	0,89	0,1	3,57 g
32.	513	B2	Jank.461	98,55	1,35	0,1	3,54 g
33.	513	B2	20/920-1	98,66	1,24	0,1	3,56 g
34.	513	B2	3B/903-58	98,63	1,27	0,1	3,56 g
35.	513	B2	20B/920-1	98,4	1,5	0,1	3,55 g
36.	513	B2	Sz.I.68.5	99,25	0,55	0,1	3,32 g
37.	513	B2	Sz.I.68.3.	97,8	1	0,1	3,56 g
38.	513	B2	Sz.I.68.4	98,9	0,9	0,1	3,54 g
39.	513	B2	109/934-2	98,6	1,2	0,1	3,57 g
40.	513	B2	20B/920-2	99,1	0,7	0,1	3,57 g
41.	513	B2	Pv.187	99,3	0,5	0,1	3,56 g
42.	518	B3	50/939	97,95	1,85	0,2	3,66 g
43.	514	B4-1	45/896-1	96,9	2,9	0,1	3,56 g
44.	514	B4-1	Sz.I.69.7	97,2	2,6	0,1	3,56 g
45.	514	B4-1	9/880-1	98,4	1,4	0,1	3,49 g
46.	514	B4-1	162/878-4	98,4	1,4	0,1	3,48 g
47.	514	B4-1	Jank.599	97,4	2,4	0,1	3,56 g
48.	514	B4-1	39B/915-1	97,93	1,97	0,1	3,56 g
49.	514	B4-1	92/895-2	98,12	1,78	0,1	3,57 g
50.	514	B4-1	3B/903-60	97,87	1,93	0,2	3,53 g
51.	514	B4-1	137/896-2	97,64	2,26	0,1	3,55 g
52.	514	B4-1	39B/915-2	99,13	0,77	0,1	3,58 g
53.	514	B4-1	60B/906-1	98,21	1,69	0,1	3,54 g
54.	514	B4-1	20B/920-3	99	0,9	0,1	3,61 g
55.	514	B4-1	105/939-3	98,47	1,43	0,1	3,58 g
56.	514	B4-1	105/939-1	97,44	2,46	0,1	3,58 g
57.	514	B4-2	26/887-1	97,51	2,39	0,1	3,54 g
58.	514	B4-3	7/893-4	99,49	0,41	0,1	3,55 g
59.	514	B4-5	26/887-3	98,13	1,77	0,1	3,54 g
60.	514	B4-5	3B/903-59	98,96	0,94	0,1	3,5 g
61.	514	B4-5	94/940	99,14	0,76	0,1	3,6 g
62.	514	B4-6	105/939-4	98,9	1	0,1	3,56 g
63.	514	B4-7	26/887-4	99,38	0,52	0,1	3,55 g
64.	514	B4-7	Dess.424	99,27	0,63	0,1	3,53 g

No.	Huszár	Pohl	Inv. no.:	Au (%)	Ag (%)	Cu (%)	Weight
65.	514	B4-8	2/883-1	99,21	0,69	0,1	3,59 g
66.	514	B4-8	22/893-1	99,42	0,48	0,1	3,55 g
67.	514	B4-10	1811.VI.4-1/1	97,74	2,16	0,1	3,59 g
68.	514	B4-10	122/892-2	98,87	1,03	0,1	3,53 g
69.	514	B4-10	1811.VI.4-I/II	98,93	0,97	0,1	3,57 g
70.	514	B4-10	Sz.I.69.8	97,74	2,16	0,1	3,56 g
71.	514	B4-11	7/893-1	99,34	0,56	0,1	3,59 g
72.	514	B4-12	162/878-5	99,5	0,4	0,1	3,51 g
73.	514	B4-12	3B/903-70	99,57	0,33	0,1	3,55 g
74.	514	B4-12	N.II.1769	99,54	0,36	0,1	3,54 g
75.	514	B4-13	7/891-1	97,48	2,32	0,2	3,59 g
76.	514	B4-13	137/896-1	98,79	1,01	0,2	3,56 g
77.	514	B4-13	7B/915-1	97,85	1,95	0,2	3,56 g
78.	514	B4-14	105/939-2	98,2	1,7	0,1	3,58 g
79.	514	B4-15	Sz.I.69.9	97,6	2,4	0,1	3,55 g
80.	515	B5-1	50B/904-4	98,47	1,43	0,1	3,61 g
81.	515	B5-2	Wesz.25/e	97,87	2,03	0,1	3,57 g
82.	515	B5-2	50B/904-2	97,68	2,12	0,2	3,57 g
83.	515	B5-2	1811.VI.4-1	98,86	0,94	0,2	3,6 g
84.	515	B5-2	1811.VI.4-1	99,07	0,73	0,2	3,57 g
85.	515	B5-2	Sz.I.68.6	96,76	3,04	0,2	3,56 g
86.	515	B5-2	112/897	98,76	1,14	0,1	3,58 g
87.	515	B5-2	50B/904-3	98,27	1,53	0,2	3,57 g
88.	516	B6	32B/917-3	99,44	0,46	0,1	3,54 g
89.	516	B6	32B/917-4	99,52	0,38	0,1	3,53 g
90.	516	B6	Dess.425	99,84	0,06	0,1	3,52 g
91.	516	B6	6B/919-1	99,2	0,7	0,1	3,53g
92.	517	B7	162/878-2	99,19	0,31	0,1	3,5 g
93.	517	B7	Jank.463	98,89	1,01	0,1	3,56 g
94.	517	B7	102/889-1	98,95	0,95	0,1	3,52 g
95.	517	B7	Sz.I.70.10	99,54	0,35	0,1	3,51 g
96.	517	B7	250/870-1	99,61	0,29	0,1	3,41 g
97.	517	B7	115/887-1	99,74	0,16	0,1	3,53 g
98.	563	C1-1	83/890-3	99,804	0,1	0,1	3,53 g
99.	563	C1-1	83/890-4	99,839	0,061	0,1	3,53 g
100.	563	C1-1	40/893-4	99,808	0,092	0,1	3,53 g
101.	563	C1-1	Wesz.26/a	99,75	0,15	0,1	3,50 g
102.	563	C1-1	67/891-3	99,758	0,142	0,1	3,55 g
103.	563	C1-1	6/888-1	99,815	0,085	0,1	3,50 g
104.	563	C1-1	7/893-5	99,8	0,1	0,1	3,57 g
105.	563	C1-1	18/891	99,8	0,1	0,1	3,54 g
106.	563	C1-1	60/892-1	99,81	0,09	0,1	3,56 g
107.	563	C1-2	32B/917-6	99,81	0,09	0,1	3,56 g
108.	563	C1-2	25/890-1	99,8	0,1	0,1	3,50 g
109.	563	C1-2	32B/917-5	99,88	0,02	0,1	3,56 g
110.	563	C1-2	83/890-6	99,87	0,03	0,1	3,56 g
111.	563	C1-2	3B/903-70	99,85	0,05	0,1	3,56 g
112.	563	C1-2	61/892-1	99,807	0,083	0,1	3,54 g

No.	Huszár	Pohl	Inv. no.:	Au (%)	Ag (%)	Cu (%)	Weight
113.	563	C1-2	113/896-1	99,85	0,05	0,1	3,55 g
114.	563	C1-2	102/891-2	99,84	0,06	0,1	3,54 g
115.	563	C1-2	10/880-8	99,86	0,04	0,1	3,57 g
116.	563	C1-2	11/892-2	99,86	0,04	0,1	3,53 g
117.	563	C1-2	287/872-2	99,85	0,05	0,1	3,55 g
118.	563	C1-2	21C/893-1	99,806	0,094	0,1	3,53 g
119.	563	C1-2	9B/912-1	99,846	0,053	0,1	3,51 g
120.	563	C1-2	67/891-1	99,8	0,1	0,1	3,47 g
121.	563	C1-2	83/890-5	99,74	0,16	0,1	3,57 g
122.	563	C1-2	67/891-2	99,837	0,063	0,1	3,54 g
123.	563	C1-3	11/892-3	99,77	0,13	0,1	3,45 g
124.	563	C1-3	83/890-7	99,45	0,45	0,1	3,43 g
125.	563	C1-3	14/890-2	99,7	0,2	0,1	3,52 g
126.	563	C1-3	7/877	99,74	0,16	0,1	3,52 g
127.	563	C1-3	Wesz.26/b	99,62	0,28	0,1	3,52 g
128.	563	C1-3	114/893-17	99,83	0,07	0,1	3,55 g
129.	563	C1-3	48/877-1	99,67	0,23	0,1	3,54 g
130.	563	C1-3	50B/904-8	99,66	0,24	0,1	3,57 g
131.	564	C2-1	Sz.I.73.3	99,8	0,1	0,1	3,58 g
132.	564	C2-1	3B/903-70	99,78	0,12	0,1	3,54 g
133.	564	C2-1	67/891-4	99,75	0,15	0,1	3,57 g
134.	564	C2-1	14/890-1	99,76	0,14	0,1	3,45 g
135.	564	C2-1	Sz.I.73.2	99,84	0,06	0,1	3,59 g
136.	564	C2-2	22/893-3	99,45	0,45	0,1	3,5 g
137.	564	C2-2	83/890-2	99,66	0,24	0,1	3,52 g
138.	564	C2-2	40/893-3	99,31	0,59	0,1	3,51 g
139.	564	C2-2	22/893-2	99,39	0,51	0,1	3,47 g
140.	564	C2-2	Sz.I.73.1.	99,7	0,2	0,1	3,48 g
141.	564	C2-3	83/890-1	99,42	0,38	0,2	3,59 g


Fig no. 1


Fig no. 2


Fig no. 3


Fig no. 4


Fig no. 5

Plate I