U. S. DEPARTMENT OF COMMERCE

National Bureau of Standards

Certificate of Analysis

OF

STANDARD SAMPLE 52A

CAST BRONZE

Analyst*	Copper	Tin	Zinc	Nickel	Iron	Manganese	Lead	Silver	Antimony	Arsenic	Phosphorus	Sulfur	Silicon	
1	88. 15	7. 81	3. 17	0. 74	0. 045	0. 019	0. 013	0. 015	0. 004	0. 003	0. 0008	0. 001	0. 0008	
2	88. 14	[a] 7. 83	3. 16	. 73	[b] . 05	. 02	. 01		. 002	. 004	. 0018	. 003		
3	88. 18	[c] 7. 83	3. 19	. 72	[d] . 05	. 02	. 011				none	[e] . 002	. 002	
4	88. 16	[f] 7. 83	3. 18	. 72	[g] . 052	. 020	. 017				trace		trace	
5	88. 19	[h] 7. 84	[i] 3. 17	. 73	[j] . 054	. 021	. 011				. 002			
6	88. 20	[k] 7. 84	3. 14	. 73	[l] . 051	. 017	. 015				$<$. 002			
7	88. 15	[m] 7. 83	3. 19	. 72	[b] . 055	. 02	. 015				$<$. 001			
8	88. 18	[c] 7. 85	3. 16	. 73	[n] . 042	. 015	. 013							
Averages	88. 17	7. 83	3. 17	0. 73	0. 05	0. 02	0. 013	0. 015	0. 003	0. 003	0. 001	0. 002	0. 001	

Analyst 1 also reported aluminum not detected (test sensitive to 0.001 percent of Al), and 0.0015 percent of gallium. Analyst 3 reported aluminum not detected.

[a] Metastannic acid and the like separated and digested in H_2SO_4-K_2SO_4. Solution diluted, tin reduced with iron, and $SnCl_2$ titrated with KIO_3.
[b] Iron reduced with H_2S and titrated with $KMnO_4$.
[c] As in (a), but tin reduced with test lead and $SnCl_2$ titrated with iodine solution.
[d] Iron reduced in a Jones reductor and titrated with $KMnO_4$.
[e] 5-g sample dissolved in HBr. Evolved gases passed through an HCl-HBr solution. Sulfur precipitated with $BaCl_2$ and weighed as sulfate.
[f] As in (c), but $SnCl_2$ titrated with KIO_3-KI solution.
[g] Weighed as Fe_2O_3.
[h] As in (a), but tin reduced with aluminum and $SnCl_2$ titrated with iodine.
[i] Weighed as $Zn_2P_2O_7$.
[j] Iron reduced with Zn and titrated with $KMnO_4$.
[k] As in (a), but tin reduced with nickel and $SnCl_2$ titrated with KIO_3-KI solution.
[l] Iron reduced with H_2S, and titrated with $Ce(SO_4)_2$ using ortho-phenanthrolin indicator.
[m] As in (a), but tin reduced with antimony and $SnCl_2$ titrated with iodine solution.
[n] Iron reduced with $SnCl_2$ and titrated with $KMnO_4$.

* LIST OF ANALYSTS

1. William D. Mogerman, National Bureau of Standards, Washington, D. C.
2. A. B. Shapiro, H. Kramer & Co., Chicago, Ill.
3. J. B. Mosley and J. Long, The Ajax Metal Co., Philadelphia, Pa.
4. Walter M. Kay, Bohn Aluminum & Brass Corporation, Detroit, Mich.
5. E. A. Schroeder and O. P. Case, The American Brass Co., Waterbury, Conn.
6. K. C. Braun, Federated Metals Division, American Smelting & Refining Co., Detroit, Mich.
7. James Brinn, L. A. Cohn & Bro., Chicago, Ill.
8. F. M. Barry and George W. Schuster, Scovill Manufacturing Co., Waterbury, Conn.

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LYMAN J. BRIGGS, *Director*.