UNIVERSITY OF AMSTERDAM

UvA-DARE (Digital Academic Repository)

Casting Rodin's Thinker

Sand mould casting, the case of the Laren Thinker and conservation treatment innovation

Beentjes, T.P.C.

Publication date
2019

Document Version
Other version

License
Other

Link to publication

Citation for published version (APA):
Beentjes, T. P. C. (2019). *Casting Rodin's Thinker: Sand mould casting, the case of the Laren Thinker and conservation treatment innovation*. [Thesis, fully internal, Universiteit van Amsterdam].

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

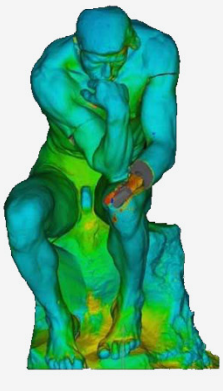
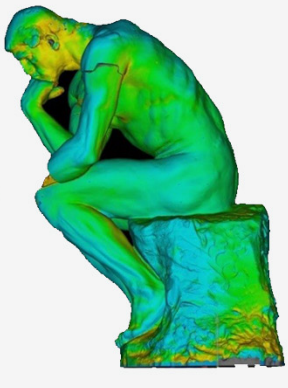
Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: https://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

UvA-DARE is a service provided by the library of the University of Amsterdam (https://dare.uva.nl)

Download date:16 May 2025

Casting Rodin's *Thinker*

Sand mould casting, the case of the Laren Thinker
and conservation treatment innovation

Tonny Beentjes

Casting Rodin's *Thinker*

Sand mould casting, the case of the Laren *Thinker* and conservation treatment innovation

ACADEMISCH PROEFSCHRIFT

ter verkrijging van de graad van doctor

aan de Universiteit van Amsterdam

op gezag van de Rector Magnificus

prof. dr. ir. K.I.J. Maex

ten overstaan van een door het College voor Promoties ingestelde commissie,

in het openbaar te verdedigen in de Aula der Universiteit

op vrijdag 22 februari 2019, te 13.00 uur

door

Theodorus Petrus Cornelis Beentjes

geboren te Uitgeest

Promotiecommissie:

Promotoren:

prof. dr. N.H. Tennent	Universiteit van Amsterdam
prof. dr. F. Grijzenhout	Universiteit van Amsterdam

Overige leden:

prof. dr. ing. M.R. van Bommel	Universiteit van Amsterdam
prof. dr. E. Hendriks	Universiteit van Amsterdam
prof. dr. H.H.M. Hermens	Universiteit van Amsterdam
dr. A.R. de Koomen	Universiteit van Amsterdam
dr. R. van Langh	Rijksmuseum Amsterdam
prof. dr. P.H. Smith	Columbia University, NY
prof. dr. J.B.J. Teeuwisse	Universiteit Leiden

Faculteit der Geesteswetenschappen

Parts of the research have been made possible by the generous support of the J. P. Getty foundation and ARCHLAB IPERION CH.

TABLE OF CONTENTS

Preface 5

Author contributions 7

Introduction 8

1. Historical development of the sand mould casting technique

1.1 Introduction 19
1.2 Sand mould casting 22
1.2.1 Types of sand mould casting 23
1.2.2 The nature of moulding sand 26
1.2.3 Compositional data of moulding sand 36
1.2.4 Grain-size distribution of moulding sand 39
1.2.5 The effect of heat on the grain-size distribution of moulding sand 44
1.3 The use of sand mould casting before the nineteenth century 48
1.3.1 Goldsmiths and medal founders using sand moulds 52
1.3.2 The early use of sand mould casting for the production of domestic wares 63
1.3.3 First evidence for piece-moulding in sand 70
1.4 The role of sand mould casting in the technical revolution of early modern Europe 76
1.5 Conclusion 79

2. The casting of sculpture in the nineteenth century

2.1 Introduction 81
2.2 Evidence for the casting of bronze sculpture directly in piece-moulds before 1800 82
2.3 The casting of sculpture in France using sand moulds: 1800-1900 87
2.3.1 Gonon and the casting of the monumental bronze of Jeanne d'Arc 88
2.3.2 Gonon's early sand mould casting technique 89
2.3.3 Launay and the first manual 90
2.3.4 Innovations in Launay's manual 92
2.4 The casting of sculpture using sand moulds in Germany: 1800-1900 99
2.4.1 Iron founding preceding bronze founding 99
2.4.2 The Gleiwitz manual 101
2.4.3 Bronze founders using sand piece-moulds: Dinger and contemporaries 104
2.5 Evidence for sand mould casting in nineteenth century Italy 113
2.6 The casting of sculpture in Britain using piece-moulds: 1800-1900 115
2.7 The lost wax casting of bronze sculpture in the nineteenth century 118
2.8 Lost wax casting of monumental sculpture in Italy between 1800-1840 128
2.9 Conclusion 131

3. Modelling and moulding an icon: Rodin's *Thinker*

3.1 Introduction 135
3.2 Rodin's atelier practice 136

3.2.1 Artist's clay model 136
3.2.2 The Thinker in clay 139
3.2.3 The Thinker in terra-cotta 143
3.3 The *Thinker* in plaster 145
3.3.1 Moulding 145
3.3.2 Plaster waste-moulding 146
3.3.3 Plaster piece-moulding 147
3.3.4 Gelatine moulding 147
3.4 Plaster models 149
3.4.1 The Foundry plasters for Rodin's Thinkers in the Rodin Museum, Meudon 153
3.4.2 The Béziers exhibition plaster of the Thinker 158
3.5 Conclusion 161

4. Casting Rodin's *Thinker*

4.1 Introduction 163
4.2 Sand moulding 164
4.2.1 The pattern 164
4.2.2 Flasks or moulding boxes 173
4.2.3 False-cores 174
4.2.4 The core 179
4.2.5 Gating system 187
4.2.6 Drying the mould 188
4.2.7 The bronze alloy 189
4.2.8 Pouring the bronze 195
4.2.9 Finishing the cast 196
4.3 Signatures and other markings 205
4.3.1 Rodin's signature 206
4.3.2 Foundry mark 210
4.3.3 Raised foundry stamp 211
4.3.4 Dedications 212
4.4 Patination 214
4.5 Lead counterweight 221
4.6 Production time 224
4.7 Conclusion 225

5. Rodin and his founders: lost wax and sand mould casting

5.1 Introduction 227
5.2 Sand mould cast *Thinkers* 227
5.2.1 Assembled bronze Thinkers versus Thinkers cast in one piece 227
5.3 Cire ou Sable: Rodin's dilemma in choosing a casting method for his bronzes 236
5.3.1 Hébrard versus Rudier: lost wax versus sand 236
5.3.2 The cost difference between lost wax and sand mould castings 244
5.3.3 The ideal of lost wax casting: the artist-founder and the founder-artist 245
5.3.4 The lost wax cast Ionides Thinker: Bingen or Gonon? 247
5.3.5 Casting features of Gonon and Bingen bronzes 251
5.3.6 Alloy composition of Gonon and Bingen bronzes 259
5.4 Conclusion 261

6. The case of the Laren *Thinker*: Controversy, Characterisation and Conservation

6.1 Introduction 263
6.2 Developing conservation options 264
6.2.1 Methodology 264
6.3 Characterisation 264
6.3.1 Condition 264
6.3.2 Materials research: analysis 267
6.3.3 Comparison with other patterns and casts 268
6.4 Determining the ideal state for the object and a realistic goal of treatment 269
6.4.1 Controversy: To restore or not to restore, that's the question! 269
6.4.2 Committees and the project team 274
6.5 Choosing the treatment method and materials 276
6.5.1 Traditional treatment options for the restoration of bronze sculpture 276
6.5.2 The conservation challenge 277
6.5.3 *3D scanning* 278
6.6 Treatment 279
6.6.1 3D printing 281
6.6.2. Filling the lacunae 282
6.7 A comparison between *Thinkers* using 3D imaging 288
6.7.1 Introduction 288
6.7.2 3D imaging of sculpture 289
6.7.3 The 3D scanning of bronze sculpture 290
6.7.4 A case study with Rodin's Thinkers 291
6.8 The use of 3D techniques for the treatment of the Laren *Thinker* 295
6.8.1 3D technology in conservation of works of art: a conservator's view 297
6.9 Communicating the treatment 299
6.10 Conclusion 301

Conclusions 303
Summary 309
Samenvatting 315
Bibliography 321
Appendices 347

Preface

When in January 2007 Auguste Rodin's stolen and heavily damaged *Thinker* from the Singer Laren museum was recovered by police officers, few of the people involved could have anticipated this would be the subject of a doctoral thesis. Although the vandalisation heavily damaged the integrity of the sculpture, it also provided a unique opportunity for research into treatment options as well as art technological aspects of its fabrication, the results of which are presented here.

As a conservator with a life-long interest into making processes, it was obvious for me that the focus of this study would veer towards the art-technological aspects of art works.
It has always struck me, as a practitioner, that the manual aspects of the process of art in the making usually receive little attention. Specific intricacies of manual techniques, often the result of years of experience of the artist in question and his collaborators, are essential for the execution of an object and determine not only to a large extent its appearance but also its future condition. It is this condition of the object that initiates the involvement of a conservator, who is by nature wondering what is really original to the object, and what the result of deterioration over time. This has happened to me also many times when examining historic bronzes and has triggered my interest into the specifics of moulding and casting, lost wax as well as sand mould casting.

Close study of bronzes usually reveals an array of technical features, ranging from core material, armatures, core pins to core plugs, foundry patches and repairs. Some of these were carried out by the original foundry, while other features were carried out later. The foundry related features can provide important information on the working methods of the foundry and can be used as a tool for authentication and dating of the bronze. While most of my questions regarding lost wax casting could be answered by technical literature or consultation of colleagues, this was not the case with sand mould casting, a situation which prompted my interest in this founding technique. Casting in sand mould is often considered to be an inferior way of casting, more suitable for producing large runs of decorative and household items and not so much the great works of art. However, over the years I have handled and examined many objects, produced in sand moulds, of very high quality, equalling and sometimes even technically surpassing lost wax castings. The more I discovered on sand moulding and casting the more I felt that its reputation was not deserved.

The use of sand as a moulding and casting material is fascinating and has an intriguing history. What struck me most during my research was the ingenuity and skill of the moulders, being able to fabricate very complex moulds in a material that is extremely difficult to manipulate, a craft now virtually lost. I sincerely hope this thesis will contribute to a greater understanding and appreciation of sand mould casting and will benefit those involved in the study of sand mould cast objects and bronzes in particular.

This thesis is the result of the input of many conversations with my supervisors, whom I would like to thank first. It was under the expert guidance of Prof. dr. Frans Grijzenhout and Prof. dr. Norman Tennent, that my doctoral research materialised into the current thesis. Two other supervisors have also been instrumental for my research, Prof. dr. Jan Piet Filedt-Kok and Prof. dr. Frits Scholten and I am very grateful for their input.

Although conducting doctoral research is chiefly a lonely exercise, I enjoyed greatly the contacts with colleagues, within the university and internationally, and without their help this research would not be possible. This research greatly benefited from the ever-increasing amount of electronically available textual sources. However, libraries and helpful librarians are still indispensable and I would especially like to thank Annie Barbera, Sandra Boujot (Rodin Museum, Paris), Cor Smulders and Julian van den Berg (RCE), David Beasley (Goldsmiths Company London) and Ad Leerintveld (Royal library, The Hague)

Conservators and curators played an important role in the research providing information on bronzes and often enabling access to the objects, and I would like to thank: David Thurrowgood, Linda Borsch and James Draper (Metropolitan Museum of Art, New York), Carol Snow (Yale University Art Gallery), Alexandra Czarnecki (Alte Nationalgalerie, Berlin), Francisca Vandepitte (Musées royaux d'Art et d'Histoire, Brussels), Sally Malenka (Philadelphia Museum of Art), Anne-Sophie Kofoed Rasmussen & Nili Baruch (Odrupgaard, Copenhagen), Jan Rudolph de Lorm, Reinier Sinaasappel, Anne van Lienden (Singer museum, Laren), Lisha Glinsman, Daphne Barbour and Shelley Sturman (National Gallery, Washington), Ulysses Grant Dietz (Newark Museum), Jane Bassett and Arlen Heginbotham (J.P. Getty museum, Los Angeles), Arie Pappot and Joosje van Bennekom (Rijksmuseum, Amsterdam), Rupert Harris and Maximilian Heimler. The support from the Rodin Museum in Paris was indispensable and I would like to thank Catherine Chevillot, Aline Magnien and in particular François Blanchetière.

This research would not have been possible without the support of my employer, the University of Amsterdam. A special thanks is for fellow researchers and practitioners: Elisabeth Lebon, Chiara Teolato, Giuseppe Rizzo, Ubaldo Vitali, Bastian Asmus, Jean Dubos, Christophe Bery, Charles Trollope, Duncan James, Jacob Simon, Christopher Fulton, Jerome le Blay, Lorenzo Morigi, Frank C. Möller,
Ad Stijnman, Karen Stemann, Mark Rabinowitz, Bill Makky, Andrea Bernardoni, Stefania Lorenzotti, Sven Dupré, Jan Dorscheid and Rozemarijn van der Molen. For the material research I am indebted to: Hans van der Weijde (Tata Steel, IJmuiden), Ineke Joosten, Luc Megens and Bertil van Os (RCE), Richard Smeets and Gareth Davies (VU Amsterdam), Dirk Goossens (KU, Louvain) and Daria Prandstraller (Unibo, Bologna).
I am grateful for the support of my UvA colleagues in general and the following persons in particular: Jan de Vries, Jørgen Wadum, Kate van Lookeren Campagne-Nuttall, Tamar Davidowitz, Ellen van Bork, Herman den Otter and Emilie Froment.

My greatest thanks go to Vivianne, Hugo and Elyas, your patience is more than remarkable and without your support I could not have completed this thesis.

Author contributions

The research presented in this thesis has resulted in various papers.[1] Some of these were co-authored. Of one of these papers, *3-D imaging as a research tool for the study of bronze sculpture*, parts have been incorporated in this thesis in the form of sub-chapter *6.7 A comparison between Thinkers using 3D imaging.*
I have used only those parts of the paper that were my original contribution. Of the three co-authors, Ronald Street, David Thurrowgood and François Blanchetière, only Ronald Street has contributed written text to the paper: the last section of paragraph *Technological research:* discussing the alignment of 3D scans and the paragraph *Accuracy of 3-D imaging*.

[1] Beentjes, Tonny et al. "The Treatment of the Damaged Bronze of Rodin's the Thinker from the Singer Museum in Laren, the Netherlands: an Innovative Approach." *METAL 2010: Proceedings of the Interim Meeting of the ICOM-CC Metal Working Group*, Charleston, South Carolina 11-15 October 2010. P. Mardikian, et al.(eds) Clemson University (2010): 269-277.
Beentjes, Tonny et al. "3-D imaging as a research tool for the study of bronze sculpture." *METAL 2013: Interim Meeting of the ICOM-CC Metal Working Group, Conference Proceedings, 16-20 September 2013, Edinburgh, Scotland.* Hyslop, E. et al (eds.) Historic Scotland and International Council of Museums (2013): 301-306.
Beentjes. Tonny and Van der Molen, R. "An innovative treatment of a severely damaged bronze, the Thinker by Rodin."*Lasers in the Conservation of Artworks IX.* David Saunders et al (eds). London: Archetype Publications in association with the British Museum (2013): 146-153. Beentjes, Tonny. "The casting of western sculpture during the XIXth century: sand casting versus lost wax casting." *Study Days of the SFIIC* 15 (2014): 120-129.