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Casting Rodin's Thinker

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

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

5.1 Introduction

This chapter seeks to shed light on Rodin's preference for the sand mould casting method, in the context of alternative casting techniques in France at the end of the nineteenth century. Artists nowadays prefer to use the lost wax method, providing them with the opportunity to work directly with the wax model, and to produce a very intricate and detailed model. The sand mould casting method required a very skilled moulder, a rigid model of the sculpture and was very labour intensive, when casting intricate shapes. Why then did Rodin choose for the majority of his bronzes the sand mould casting method instead of lost wax casting, which is easier to perform and gives often greater detail?

Economic factors might have played a role in this because sand mould casting was considered, at the time, a more cost-effective way of casting. There is, however, documentation from at least one foundry offering Rodin to cast his sculptures using the lost wax casting method at competitive prices, and yet Rodin preferred to have most of his bronzes cast using sand moulds.[766] The aim of this chapter is therefore to demonstrate why Rodin chose so often to have his sculptures cast using sand moulds. The information gathered in the previous chapter 4, detailing the moulding and casting, will be used now to explain and reflect on technological features of Rodin bronzes in general and *Thinkers* specifically. Because the literature on Rodin bronzes gives insufficient information to answer this question properly, it is hoped that the art-technological features of the actual bronze artworks can provide more clarity in this matter.

5.2 Sand mould cast *Thinkers*

5.2.1 Assembled bronze *Thinkers* versus *Thinkers* cast in one piece.

As we have seen, bronzes, lost wax as well as sand mould cast, were cast sometimes in parts or as a whole. With a bronze cast in one piece, this means the bronze was cast in its entirety in one single pour, forming one single unit. When parts are cast separately and joined to form part of the final sculpture, this is referred to as an assembled bronze (*assemblage*). This joining can be mechanically or by soldering, brazing, welding or by casting-on parts.[767] Minor repairs are normally not regarded as part of the assembly. The term 'cast in one pour', as a direct translation of the French term *fonte d'un seul jet*, is not ideal, because sometimes parts of bronzes cast in separate pieces were often cast in the same flask, with metal from the same

[766] Le Romain-Normand 2007, 28.

[767] Oxy-acetylene welding or gas welding became commercially available around 1910; *Le chameau son histoire*, [online] Available at: <http://chalumo29.free.fr/ >, [accessed 1 June 2018]

crucible. By pouring all the metal in one single pour from the crucible, the founder assured that all the different parts had the same composition and colour and would develop identical patinas. The term cast in one piece is therefore preferable.

Despite the fact that the foundry of Eugène Rudier's father, Alexis, was mainly producing small *objets d'art* in precious metals and bronze, Eugène took an interest in the founding of larger bronze sculpture.[768] This interest might have been sparked by the commissions given by Rodin to his uncle François Rudier. In his uncle's foundry he must have become acquainted with the sand mould casting of complex large bronzes such as the *Thinker*. It is known that Eugène started experimenting with the casting of bronzes in one piece (*seul jet*) in 1897, when he started casting for the son of Mathurin Moreau.[769] It would be tempting to assume that Eugène acquired his bronze founding skills from his uncle but technical evidence seems to suggest differently. If one looks for example at the head of Rodin's St. *John the Baptist*, both cast using sand moulds, one by François and one by Eugène, a marked difference can be observed (figs. 5.1 & 5.2).

Fig. 5.1. The interior of two casts of Rodin's *Head of St. John the Baptist*. Bronze, sand mould casting. On the left a cast by the Alexis Rudier foundry, before 1952 from the personal collection of Eugène Rudier (Rodin Museum, Paris. S.771) and on the right a cast by François Rudier, 1901 (Rodin Museum, Paris, S.519)

Because the face of St. John the Baptist is an undercut area with details in the overhang, both the sand moulders had to come up with a solution to mould this difficult part of the sculpture. François resorted to casting this sculpture in two parts and mechanically fix them together with bolts.

[768] "bibelots d'orfèvrerie en argent et en or, et occasionnellement aux bronzes d'art"; Moreau-Vauthier, Paul. "Le maître fondeur Eugène Rudier." *L'Art et les artistes*. March (1936): 203-209.
[769] Moreau-Vauthier 203.

Fig. 5.2. Detail of the rim of two casts of Rodin's *Head of St. John the Baptist*, bronze, sand mould casting. On the left a cast by the Alexis Rudier foundry, before 1952 from the personal collection of Eugène Rudier (Rodin Museum, Paris, S.771) and on the right a cast by François Rudier, 1901, (Rodin Museum, Paris, S.519). Note the much yellower colour of the alloy.

Eugène or his workers, came up with a different solution: *St. John the Baptist* was also cast in two sections but the parts were fused together either by brazing or by casting one section onto the other. Another difference between the two bronzes is the wall thickness of the casts; the Alexis Rudier cast is almost half the thickness of the François Rudier cast and as a result much lighter. To achieve this, Eugène, or his workers, used several core pins, these had to be plugged afterwards though and gave the founder thus extra work but ensured a much thinner cast with less risk for casting defaults. A thinly walled casting in addition can be brazed with much more ease, requiring less heat during brazing.
If one looks now at the technical differences between *Thinkers* cast by François Rudier (fig. 5.3) and Eugène Rudier, a comparable situation can be observed (fig. 5.4).

Fig. 5.3. Interior view of bronze *Thinker* at the Ny Carlsberg Glyptotek in Copenhagen, 1901, cast by François Rudier in sections.

Fig.5.4. Interior view of the Yale *Thinker*, cast by the Alexis Rudier foundry, 1928 or earlier.

Again, a difference between a bronze cast in separate parts and bronzes cast in one piece can be observed. The François Rudier cast has a much thicker wall thickness and is therefore significantly heavier. In addition to this, the alloy used by François Rudier is much yellower compared to the Alexis Rudier cast, this is something that can also be observed with two casts Rodin's *Head of St. John the Baptist*. In 1901, François Rudier delivers three *Thinkers* to Rodin and one of these is probably the cast in the Glyptotek in Copenhagen.[770] As discussed above, the Copenhagen *Thinker* was cast in sections, the Berlin *Thinker* cast in one piece, as was the Washington bronze. The Berlin and Washington casts are not only similar in facture,[771] they also have both the raised A. Rodin stamp inside (fig. 5.5).[772]

On the basis of the technical differences between the Copenhagen and the Berlin and Washington casts, it is tempting to see the hand of Eugène in the latter two. Unfortunately, neither of the three casts carry a foundry mark. François Rudier rarely marked his casts whereas Eugène used, from at least as early as 1904, consistently the inscription 'Alexis Rudier / Fondeur Paris'.[773] Could it be that Eugène Rudier's experimentation, to cast bronzes in one piece, was so perfected that by 1903 he was commissioned by Rodin to cast original size *Thinkers* and that Eugène in fact produced the Berlin and Washington casts?[774]

[770] Le Norman-Romain 2007, 586. *Thinker* in Ny Carlsberg Glypotek in Copenhagen (inv.no. MIN 605)
[771] They both are cast in one piece and both have the same type of lead counterweight inside in the form of a rectangular brick high up inside.
[772] Alte Nationalgalerie Berlin (inv.no.B I 210) and National Gallery of Art, Washington DC (inv.no. 1942.5.12 (A-76))
[773] Enlarged *Thinker* Rodin Museum, Paris (inv.no. S.01295)
[774] Isabelle Vassalo mentions in her dissertation an invoice by the Alexis Rudier foundry for 925 Francs dated 23-12-1902 for a *Thinker*, likely to be the Washington *Thinker*: Vassalo, 1992, *liste des fontes*: Rudier Alexis; Penseur.

Fig. 5.5. The raised A. Rodin stamp inside the Berlin *Thinker*, Alte Nationalgalerie, Berlin.

But if Eugène's technique differed so much from his uncle's, where did he get the idea and skill to cast such a complex hollow sculpture in one piece, enabling him to develop a very successful foundry business. For a possible answer to this question, we have to look at an earlier *Thinker*, cast by Auguste Griffoul and now preserved in Geneva.[775] Griffoul was commissioned by Rodin to cast two original size *Thinkers*, the second and third casts.[776] These casts by Griffoul are the first sand mould castings of this model.[777] Auguste Griffoul was the son of Jean-Baptiste Griffoul (? -1894), who worked in partnership with François Rudier from 1881 till 1882. In 1882, this partnership ceased and Jean-Baptiste Griffoul started to work with Jean Nicolas Lorge. This new partnership, Griffoul et Lorge, produced from 1887 till the end of the partnership in 1894, over a hundred bronzes for Rodin.[778] These bronzes, all cast in sand moulds, are usually technically of a high standard (fig. 5.6).

Auguste Griffoul takes over his father's foundry in 1895 and is commissioned by Rodin in 1896 to cast, in sand, the previously mentioned *Thinkers*.[779] The Geneva cast is well-executed, in one piece, with good exterior surface detail.[780] Auguste Griffoul casts around thirty-nine bronzes for Rodin, between 1895 and 1899, when he emigrated to the United States.[781]

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[775] Musée d'Art et Histoire Geneva, 1896. (inv.no. 1896-0011)

[776] For the complete casting sequence see appendix 2.

[777] Nasjonalgalleriet Oslo, 1896 (inv.no NG.S.00638) & Musée d'Art et Histoire Geneva, 1896. (inv.no. 1896-0011)

[778] Lebon 2003, 173.

[779] Auguste continuous to operate under the name J. B. Griffoul till 1898 when he registers his foundry company under the name Griffoul et Cie. In effect the Geneva and Oslo *Thinkers* from 1896 were cast under the father Griffoul's name by the son, a situation which was going to be repeated by the Alexis Rudier foundry under Eugène Rudier.

[780] This can also be ascribed to the fact that the foundry model supplied to Griffoul was very close to Rodin's original model and was therefore likely to be very detailed. Over time through moulding and re-moulding foundry models show a noticeable loss of detail which can be observed with the foundry models preserved at the Musée Rodin in Meudon. The castings by Auguste Griffoul were not always executed that well, the Tragic Muse from 1896 also in MAH in Geneva (inv.no. 1896-10) is reported to have several defects; Le Normand Romain 2007, 545.

[781] Auguste (L) Griffoul established a foundry 1905 in Newark (New Jersey), first on 313 Halsey Street (casting gold, silver and bronze) and later on 250 Chestnut Street (silver founder) then moved to 280 Chesnut Street (brass and bronze founders). His success seems to have peaked in the early 1910s when he brought his brothers Henry and Marcel into the firm. By 1917 the brothers had left Newark, and Auguste himself moved to

Fig. 5.6. Auguste Rodin, *Monument for Victor Hugo*, conceived 1890, sand mould cast bronze from 1891, marked by Griffoul et Lorge. (H. 28,2 x L. 29 x D. 36 cm) Rodin Museum, Paris (S.1073) (image left Rodin Museum, Paris). Image on the right shows the interior of this bronze.

The interior of the Griffoul Geneva *Thinker*, with all traces of sand mould casting, is remarkably similar to the castings by the Alexis Rudier foundry (figs. 4.97 & 5.7).

Fig. 5.7. Interior of Geneva *Thinker*, a sand mould casting by Auguste Griffoul, Paris, 1896. (Musée d'Art et Histoire Geneva)

Is it possible that Eugène Rudier acquired some his bronze moulding and casting skills from father or son Griffoul, through the connection of his uncle François Rudier, once the business partner of father Griffoul? The other possibility is of course the transfer of skills between

Ohio by 1920. I am grateful to Ubaldo Vitali and Ulysses Grant Dietz, Chief Curator of Decorative Arts, Newark Museum, for this information.

workshops by employees. A foundry capable of casting larger bronzes is rarely a one-man operation and therefore usually employs several workmen. Although it is not clear to what extent the Alexis Rudier foundry or the Griffoul foundry employed workmen, when dealing with larger commissions, it is likely however that some foundry men were employed, if not full time then at least temporarily. These unknown foundry men, often highly skilled and carrying out the actual moulding and casting, would bring specific knowledge with them when working for different foundries. Perhaps Eugène Rudier was making use of the skills of such a foundry worker, previously employed by the Griffoul foundry.[782]

From the above given examples, such as the *Head of St. John the Baptist* by the Alexis Rudier foundry and the *Antony Roux Idylle* by Griffoul et Lorge, one can see that, although these foundries had the abilities to cast bronzes in one piece, sometimes there was a technical advantage to build up the sculpture from separate castings.[783] It could be that the undercuts posed a problem but also the fact that certain areas of the surface could not be reached for finishing, when cast in one piece. To make it possible to finish an object by filing, sanding or chasing, one needs sufficient space for the tools and the hands that hold these tools and even more importantly, a clear undisturbed view of the surface being worked. The ability to finish the entire surface area of a bronze was of paramount importance of the majority of fine bronze sculpture up to the last quarter of the nineteenth century.[784] Rodin bronzes increasingly show less interference with the surface through after-work, such as filing, chasing and patination.[785] When Rodin completed a model, which could take considerable time and many versions, he was not very keen on the fact that during the casting process alterations to his models might take place. For example, in search for a founder for the first bronze cast of the full-size group of the *Burghers of Calais* in 1894, Rodin was not pleased to hear that the founder approached, Jean Baptiste Griffoul, intended to separate the figures in order to cast them, and the commission was in the end granted to the Leblanc-Barbedienne foundry instead.[786] This firm, however, also suggested to Rodin to cast the sculpture not in one piece, by dividing the two central figures in two separate parts.[787]

No sculptor is keen for his/her carefully-produced model to be cut in pieces and subsequently re-assembled again, since this means that the surface of the model near the seams, will be altered. An area of at least a few millimeters on either side of a seam will have to be worked and refinished, to resemble the original surface, work usually carried out not by the artist but by a foundry worker instead. Even the most skilled chaser can only reproduce an impression

[782] The archive of the Alexis Rudier foundry was, as instructed by Eugène Rudier, destroyed in 1952, after the founders death. Therefore very little is known about the employes of the Rudier foundry

[783] Another factor for casting large sculpture in parts is often the limited capacity of the foundry's melting furnace.

[784] With notable exception of Gonon's early lost wax casting, see sub-chapter 2.7 *The lost wax casting of bronze sculpture in the nineteenth century* in this thesis.

[785] Le Romain-Normand 2007, 31-32.

[786] Ibid 214. Another factor for the choice for another foundry was the fact that Griffoul was experiencing financial difficulties at the time.

[787] Letter from Gustave LeBlanc-Barbedienne on October 23rd 1894 in the MR archives; Le Romain-Normand 2007, 216.

of the original surface and chasing tools are often not capable of reproducing subtle surface characteristics of a modelled and cast surface. Although Rodin had a preference for his bronzes to be cast in one piece,[788] and the Alexis Rudier foundry was capable in doing so, there is evidence that Alexis Rudier bronzes were not always cast in one piece. For example, the monumental *Burghers of Calais* group which Rodin was so keen to have cast in one piece in 1894, has a cast of 1905-08 by the Alexis Rudier foundry which is clearly cast in separate parts (fig. 5.8).[789]

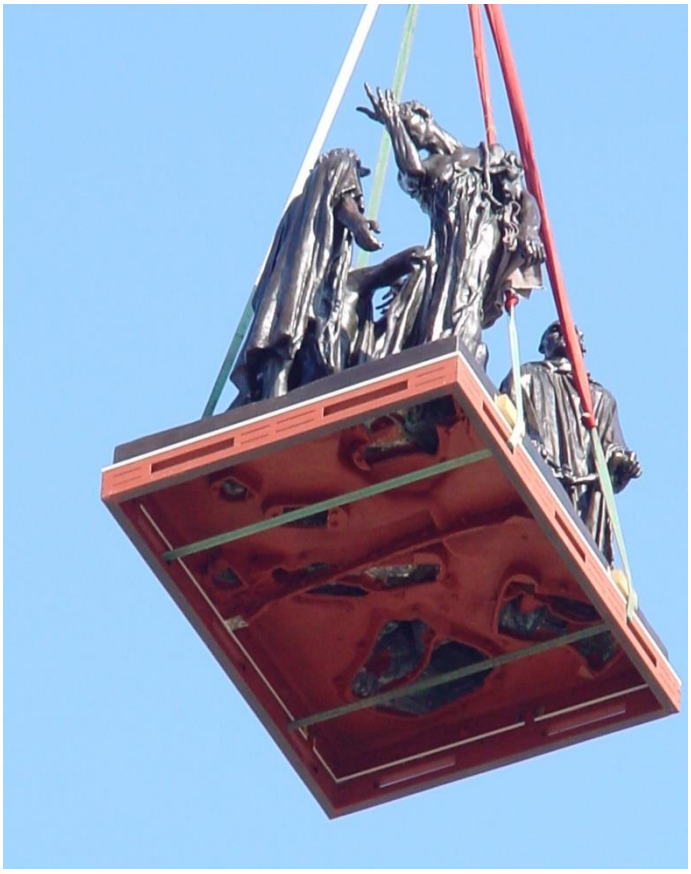

Fig. 5.8. View of the underside of the *Burghers of Calais* group at Westminster during re-installation after conservation treatment. (image Rupert Harris Conservation)

Even the monumental *Thinker* initially cast in 1903-04 by the Alexis Rudier foundry in one piece, was later produced in separate parts (fig. 5.9).[790] It is likely that although Rodin, like most artists, would have preferred to have a bronze cast in one part, the practicalities of the founding process made that often bronzes were cast in parts and then assembled.

[788] Le Romain-Normand 2007, 31-32.
[789] Now in Westminster (London)
[790] The technical aspects of the monumental *Thinker* are not the focus of this thesis and access to the interior of these large bronzes is very difficult. in addition to this, not much photographic documentation exists of the interiors of monumental *Thinkers*.

Fig. 5.9. Robert Doisneau, silver gelatine print, 1950. The monumental size *Thinker* in the Alexis Rudier foundry during assembly, illustrating the use of sleeve joints. It dmonstrates that the monumental size *Thinker* was not always cast in one piece but also assembled from separately cast parts in the Alexis Rudier foundry. (image Rodin Museum, Paris)

5.3 *Cire ou Sable*: Rodin's dilemma in choosing a casting method for his bronzes.

5.3.1 Hébrard versus Rudier: lost wax versus sand

While the previous paragraph looked at the early sand mould cast *Thinkers*, this paragraph examines Rodin's use of the two competing casting methods, lost wax and sand mould, in relation to the commission of the first monumental *Thinkers*.

On 21 April 1906, when intellectual Paris gathered in front of the Panthéon for the unveiling of Rodin's enlarged bronze version of the *Thinker*, few of the people present would have been aware of the background of intense competition between two foundries for the commission for the casting of this bronze (fig. 5.10). By 1906, the sculptor already had a long history of using both sand mould as well as lost wax casting.[791] Rodin was a pragmatic artist and when a work sold well, he did not shy away from producing multiple casts. Whereas the public installation of the monumental *Thinker* was a recognition for a new direction in sculpture, the method used to cast this bronze was far from innovative. Rodin's decision to employ the Alexis Rudier sand mould casting foundry was a safe choice for a well-established traditional technique.

Fig. 5.10. Marcel Hutin, unveiling of the *Thinker* in front of the Panthéon, 21 April 1906 (image Rodin Museum, Paris)

From the second half of the 1880s, Rodin employed a great variety of foundries, the vast majority using the sand mould casting method, until he started to commission two remarkable founders, Adrien-Aurélien Hébrard (1865-1937) and Eugène Rudier (1878-1952), around 1902-03.[792] These two founders could hardly be more different from each other. Rudier came

[791] Laurent, Monique. "Observations on Rodin and his Founders" *Rodin Rediscovered.* Exh. Cat., National Gallery of Art, Albert E. Elsen (ed) (1981): 285-293.
[792] Fifteen and possibly more: *Table of founders* in Le Normand-Romain 2007, 730-731.

from a family of founders, all working in the sand mould casting technique. At the end of 1901 the foundry, still named Alexis Rudier, started a long working relationship with Rodin, that would last until the artist's death.[793] Eugène Rudier and Rodin were later to become good friends.[794]

Hébrard, an academic collector from a wealthy bourgeois background, started his lost wax foundry from his passion for modern sculpture in December 1902. In 1903 Rodin was encouraged to make the *Thinker* in a larger, more monumental size and commissioned Henri Lebossé (1845-1922) to make an enlargement, using a mechanical device called a Collas machine.[795] When Hébrard heard about the large *Thinker* project, he quickly realised the potential for future work for his foundry. Hébrard, eager to cast the bronze, offered Rodin to cast the large *Thinker* at a reduced price.[796] Rodin accepted this offer and Hébrard set to work on the newly enlarged bronze. It was this *Thinker* Rodin wanted to present at the St. Louis World fair opening in April 1904. Rodin, wary of inexperienced founders full of promises, also ordered around the same time a large *Thinker* from Rudier. At the end of 1903, just before Christmas, Hébrard finally managed to cast the large bronze.[797] The newly cast sculpture was not ready yet because the surface of the bronze had to be finished and prepared for patination. Because it had taken Hébrard so long to cast the bronze,[798] he had to be pressured by Rodin to finish the *Thinker* in time for patination by the Limets.[799]

Although Hébrard regarded the given three-week time span for finishing the bronze almost impossible, the finished sculpture was delivered just in time for patination, on January 17 1904. This cast by Hébrard is often referred to as the first monumental *Thinker* and the Rudier cast, delivered on December 29, 1903, as the second cast. But if Hébrard considers three weeks as almost impossible to finish his version, it seems a rather tall order for Rudier to cast, finish and deliver a bronze of this size in just a few days! Therefore, the Rudier bronze must have been cast earlier than the Hébrard cast. As Limet takes delivery of Hébrard's bronze on 17 January 1903 and Rudier's version the next day, he probably started his patination work on Hébrard's bronze first.[800] With these two *Thinkers* cast, finished and patinated almost simultaneously, it is hard to say now which of these was the first one. Although Hébrard was very pleased with his result, this could not be said of Rodin when the artist examined the

[793] The earliest cast by the Alexis Rudier foundry for Rodin appears to be the large Age of Bronze commissioned by Dr Max Linde in November 1901 in replacement of the faulty Leon Perzinka cast , now preserved in the National Gallery of Canada, Ottawa(inv.no 6473). Personal communication with Jérôme Le Blay, 28-11-2014.
[794] The Alexis Rudier foundry would continue to cast Rodin bronzes after the artist's death in 1917, now for the Rodin Museum and continued to do so this the death of Eugène Rudiers death in 1952.
[795] Elsen, Albert. "Rodin's perfect collaborator, Henri Lebossé." Elsen 1981, 249-259.
[796] Le Romain-Normand 2007, 28.
[797] "Noël ! Le Penseur est fondu et tout permet de croire qu'il est réussi": Christmas card dated 25 December in the archive of Rodin Museum, Paris (ms 563)
[798] Louis Vauxcelles details some aspects of Hébrard working methods for the large *Thinker* in an article on lost wax casting from 1905. The total heating cycle for the wax burn-out took around six weeks and the patination six months, see Vauxcelles 1905, 193 & 195.
[799] Le Normand-Romain 2007, 591.
[800] Documents in the archive of Rodin Museum, Paris: Accounts relating to Rodin's carrier Autin , February 29, 1904 and a letter dated 18 January 1904 from Hébrard to Rodin. I am indebted to François Blanchetière for providing this information.

bronze in Limet's studio. Rodin was very displeased with the finish, resulting from chasing, to bring back details lost in the casting.[801] In addition to this, it is also likely that Rodin noticed changed details in the modelling because of adjustments in the wax. The wax models, using gelatine moulds, were often lacking in detail or displayed an irregular surface because of the air bubbles in the gelatine and usually required remedial work.[802] Rodin was so displeased with the Hébrard cast, he did not want to send it to the imminent St. Louis World fair, despite his promise to the organisers. In the end, Rodin was pressured by the organisers in St. Louis into sending the Hébrard cast to the United States, but before the opening of the World fair, he decided to disown the bronze and to withdraw and replace it with a plaster model of the *Thinker*, he already sent to America on 16 March.[803] He even considered sending the Rudier cast, but this was already promised to a private client. Already commissioned before the debacle with the first bronze, Hébrard would make only one more *Thinker*, in the same year (fig. 5.11).[804]

Fig. 5.11. The second monumental lost wax cast *Thinker* at the Hébrard foundry, Paris, soon after casting, 1903 or 1904. Please note the lantern still protruding from the top of the skull. (from *La Vie illustrée*, 8 July 1904)

[801] Le Normand-Romain 2007, 591.

[802] For Hébrard's working method, including the use of gelatine, see Vauxcelles 1905, 189-197. Rodin was familiar with the fact that once the wax model was completed by the foundry, it required retouching by the artist as he is quoted in 1881: "Each piece will come to me from the founder in prepared wax and I will retouch it." "Chaque morceau me revient de chez le fondeur en cire préparée / et je le retouche" Letter to the Beaux-Arts commission discussing the Gates of Hell from December 11th 1884, quoted in translation in Elsen 1960, 70. This letter proposes Bingen as the founder of the Gates. See also appendix 4.

[803] Accounts relating to Rodin's carrier Autin , March 31, 1904 in the archives of the Rodin Museum, Paris.

[804] Now preserved at the Ny Carsberg Glyptothek in Copenhagen.

Hébrard seems to have listened to Rodin's criticism on changing details in the after work, because the second Hébrard *Thinker* shows very little after work in the form of chasing.[805]

This was Rodin's second period of using lost wax founders. The first period was from 1882 until 1886, when Rodin became interested in the lost wax technique and commissioned the Gonon and Bingen foundries.[806] It was also during this period, 1884, that the artist mentions lost wax casting as "the only process which can render my sculpture."[807] How should we view this remark especially in the light that the vast majority of Rodin sculptures were cast using the alternative technique, sand mould casting. First of all, the context of this remark should be explained. It was in a letter from Rodin to a government minister in which the artist discusses the casting of the *Gates of Hell*. In the letter he also mentions the quote by Bingen of 35.000 Francs for the casting of the sculpture. The letter is dated 11 December 1884 and falls in Rodin's first period of experimentation with the lost wax technique. It is in the beginning of his career and Rodin is not yet producing his bronzes in large multiple editions. The fact that the quote is in connection with the *Gates of Hell* is an important factor as well. This is a very intricate piece of sculpture and an artist wanting his/her sculpture to be cast in as few parts as possible, thus preventing unnecessary cuts in the model. Bingen proposes to make the Gates of Hell in five separate parts.[808] A sand mould casting around that period would have required considerably more parts.

Rodin was going to use a lost wax foundry one last time around 1912-13, when the Montagutelli brothers produced busts and statuettes for the artist. This relationship however, was short lived because Rodin soon discovered that this foundry was also producing unauthorised casts of his work, which forced Rodin to take legal action against the foundry.[809]

During three periods in his career, Rodin was willing to try out lost wax casting but every time he was disappointed and went back to the trusted sand mould casting. Although Rodin looked critically at the prices asked by foundries, he was prepared to pay a premium if the foundry performed up to his standards. Apart from an artist, Rodin was also a business man, who demanded basically two things from his foundries: sound castings, accurate to his models and prompt delivery within the agreed time, and when a foundry disappointed him he was very reluctant to commission this founder ever again.[810]

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[805] Fronsmark, Anne-Brigitte. *Rodin. La collection du brasseur Carl Jacobsen à la Glyptothèque Copenhagen*. Ny Carlsberg Glyptotek (1988): 76.

[806] See next sub-chapter

[807] "Le travail de la fonte à cire perdue, le seul qui pourra rendre ma sculpture."; Rodin writing to a government minister on 11 December 1884, see Le Normand-Romain 2007, 21.

[808] "Je m'engage à exécuter en bronze à cire perdue en cinq parties differentes…" letter from Bingen to Rodin, dated 25th of July 1884. Archives National Paris (F21/2109)

[809] Le Normand-Romain 2007, 33.

[810] For example Pierre Griffoul who in 1903 excuses himself for not giving his full attention to the quality of cast because of the birth of his daughter, see Lebon 2003, 174 & Perzinka for the faulty *The Age of Bronze* for Max Linde in 1900, see Le Normand-Romain 2007, 27.

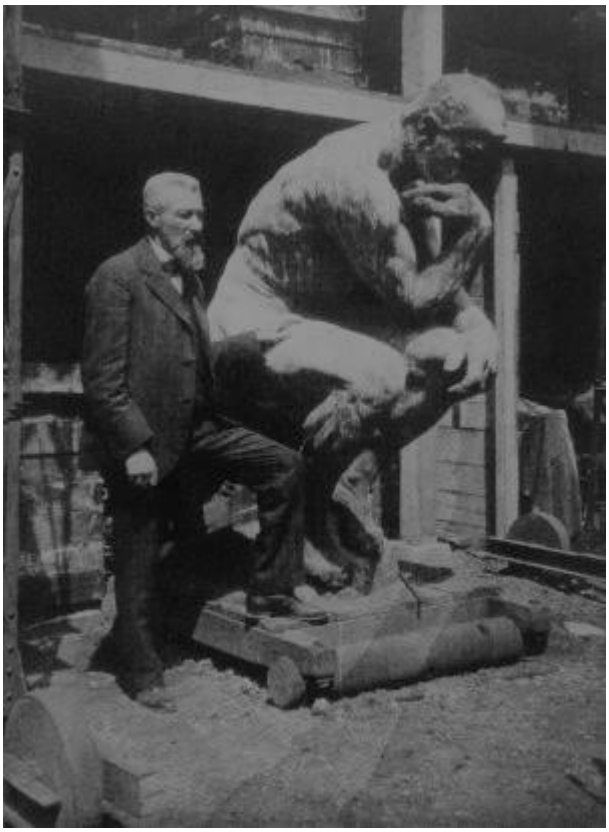

Fig. 5.12. Eugène Rudier at the Alexis Rudier foundry in Paris with a sand mould cast monumental *Thinker* (from Hoffman 1936, 87)

From 1904 onwards, it was the Rudier foundry that was able to satisfy Rodin's demands and was almost the exclusive supplier of Rodin bronzes till the artist's death and even later.[811] Rudier would cast all the subsequent *Thinkers* including the Panthéon cast (fig. 5.10) and the one on sculptor's grave at Meudon, all produced using the sand mould casting method.[812] Even after Rodin's death, when the French state inherited Rodin's estate and thus the right to cast posthumous casts, the Rudier foundry was the preferred foundry to cast Rodin bronzes in sand until 1952, when Eugène Rudier died. Rodin was not alone in his preference for Rudier's sand mould castings. Artists such as Maillol, Bourdelle, Despiau and Malvina Hoffman (1885-1966) frequently commissioned bronzes from Eugène Rudier (fig. 5.12).

[811] Eugène Rudier became Rodin's principal founder, casting nearly five hundred bronzes in Rodin's lifetime, see Le Normand-Romain 2007, 30.

[812] The Pantheon *Thinker* was cast at the end of 1904 but only unveiled in front of the Panthéon in April 1906 and is now placed in the garden of the Hotel Biron, Rodin Museum Paris.

Fig. 5.12. Malvina Hoffman and Eugène Rudier posing with Rudier casts of Hoffman's sculptures for the *Hall of the Races of Mankind*, intended for the Field Museum in Chicago. Paris 1932-33. (image Malvina Hoffman Papers (box 83) at the Getty Research Institute LA.)

Apart from price, quality of the castings and the reliability of the foundry, there might have been another motive for Rodin to prefer sand mould casting over lost wax casting: the aesthetic quality of a sand mould cast surface.

If one looks at the Alexis Rudier casts they all have a fairly identical surface, the patination might vary but the surface detail is usually very consistent. It is a surface that has undergone very little after-work with abrasive methods such as filing, scraping or sanding.[813] The surface details are usually fairly smooth and give the bronze, from a morphological point of view, a soft, almost marble-like, surface. The surface of lost wax bronzes in contrast has often rather sharply defined details usually as a result of extra work in the wax, although the surface of a well-executed sand mould cast can come very close to that of a lost wax cast surface, capturing even details such as fingerprints and tool marks.

The difference between the two surfaces is usually the type of detail and the extent of the undercutting of these surface details. In finely detailed surface areas, such as hair, the lost wax technique allows the undercutting of even the smallest details whereas the undercutting of a sand mould surface is usually limited to the larger details. This is because the undercuts in a

[813] Exception to this are of course fillings such as plugged core pin holes, filled lantern holes and plugged casting defects which are finished by filing and chasing to blend into the surrounding surface.

sand moulding are created by using small false cores and there is limit to the size of a false core a moulder can physically manipulate. The lack of these tiny undercuts gives the sand moulded surface, a less open and more solid appearance, similar to a stone carved surface. This is not surprising because with both techniques, sand mould casting and stone carving, it is very difficult if not impossible to create minute undercut surface details. Because these small overhanging surface details are problematic in the sand moulding process, they are usually eliminated earlier in the making process. This could already have been done from the start in the modelling phase with the artist realising that certain overhanging details in his clay model would be impossible to mould using a rigid piece-mould. The artist would therefore avoid making these minute undercut surface details. The transfer from the ephemeral clay model to more durable plaster, might also have contributed to a less open surface and sometimes this was intentionally enhanced by dipping the plaster.

Even when a waste mould was used, which preserves all the undercut details, the subsequent steps often involved the use of rigid plaster piece-moulds incapable of moulding minute overhanging surface details.[814] If the artist in the modelling phase had not eliminated already the small undercut details, it would be up to the moulder to fill these details and thus create a surface suitable for piece-moulding.

Could it be that Rodin, with a background in stone carving, favoured the soft tactile surface of a sand mould cast surface over a, too detailed, lost wax surface? It is known that Rodin was trying to move away from the bourgeois pretty female portraits, with an overly worked smooth finished surface full of detail, produced early in his career, towards more abstraction. These commercial works, such as *Dosia* (1874) and *Suzon* (1875), conformed to the contemporary notions of beauty and provided Rodin with a much-needed source of income. The revenues of large editions of these sculptures, produced in a variety of media, enabled Rodin to work at the same time on more original work such as *The Man with the Broken Nose* (1875) and *The Age of Bronze* (1877). Rodin distanced himself from these early commercial works and he developed a style of modelling whereby he gets rid of overly finished surfaces with pretty decorative details to get to the essence of a sculpture resulting in a less open, abstract surface free from details with small undercuts.[815]

This development in Rodin's modelling meant that his sculpture models became very suitable patterns for sand mould casting.[816] These patterns were invariably made from plaster, a material which takes a significant place in Rodin's sculptural oeuvre as he was one of the first sculptors to exhibit his work in plaster in its own right.[817] In the course of Rodin's career as a sculptor the work in plaster, bronze and marble appears to get closer in terms of surface

[814] This does not apply to gelatine moulding but this was not often used by Rodin's moulders.
[815] "It's the sculpture [Suzon] I once did to earn a living and which I sold to minor art dealers for twenty to thirty francs. It is not good. I'm even ashamed that it has been kept." see le Normand-Romain 2007, 664.
[816] Wasserman observes a similar movement with Rodin's contemporary Aristide Maillol (1861-1944), who also moved away from lost wax casting in favour of sand mould casting, see Wasserman, J.L. *The Young Cyclist by Aristide Maillol*, Acquisitions (Fogg Art Museum), No. 1962/1963 (1962 - 1963): 17-20.
[817] Höcherl 2003.

morphology. In effect they become to a certain extent interchangeable whereby the nature of the material is secondary.

It has been suggested by de Caso that when Rodin's popularity increased, and he was selling more and more bronzes, he turned to sand mould casting because this was the only technique capable of serial production.[818] This is only partly correct: most of the smaller bronzes could indeed be cast must faster in sand than in wax. These smaller bronzes were cast using sand moulds in a relative short time because their piece-mould consisted usually of a limited number of false cores, making the moulding process and the subsequent drying of the mould relatively short. Some of these smaller bronzes proved very popular and justified the expense of making a copper alloy pattern with detachable parts called a *chef modèle* (fig. 5.13).

Rodin was one of the first major artists utilising the serial production capabilities of sand mould casting. From the moment of completion of the clay model, Rodin's involvement with the production was minimal: the plaster model and the plaster pattern were made by professional moulders, the bronze cast was produced by a foundry and finally the patination by his personal patinator. Rodin's involvement was most likely limited to the choice of patina and final approval of the finished bronze. Sand mould casting made it possible for Rodin to separate the design and production process. This has two major advantages: firstly, the large-scale serial production of Rodin bronzes and secondly enabling Rodin to focus most of his energy and time on the creation of new work. With lost wax casting this would have been more difficult because of the necessity for Rodin to be personally involved in the re-working of the waxes.

The sand mould casting of, middle to large bronzes was more complicated, requiring multiple and large false cores. In addition, the drying of these larger mould pieces would take more time and making thus the time advantage compared to lost wax casting, considerably less. For the middle and large bronzes, it was not so much the technique that was the issue, it was more the experience and capacity, differing between sand and lost wax foundries. Most of the latter were small, often one-man foundries who were still in the process of adapting lost wax casting to serial production. The sand mould casting foundries were usually larger companies, employing tens even hundreds of foundry men, using a well-established technique.[819]

[818] De Caso and Sanders 1977, 31.

[819] The Parisian foundry Barbedienne employing for example in the early 1870s around six hundred workers: Rionnet, Florence. "Barbedienne ou la fortune de la sculpture au XIXe siècle" *Bulletin de la Société de l' Histoire de l' Art français* (vol.2001), (2002): 305.

Fig. 5.13. Detail of the assembled *chef modèle* of Rodin's *La jeunesse triumphant.* Note the pins holding the various detachable part together. Rodin Museum, Paris (inv.no. S.2474)

5.3.2 The cost difference between lost wax and sand mould castings

Authors such as Launay, Altmütter and Fesquet all mentioned the higher cost of lost wax casting.[820] It is therefore interesting to compare prices charged by lost wax founders and sand mould founders, commissioned by Rodin. The number of comparisons that could be made is rather small, since the lost wax founders used by Rodin during this period only produced a handful of bronzes for Rodin. These bronzes were often not specified in invoices, often only described as bust or statuette. A further limiting factor is that the lost wax and sand moulded bronze should be of the exact same model and cast within a few years of each other. Despite these limitations there are a few examples. In 1883 François Rudier charged two hundred Francs for the casting of a *Bust of Victor Hugo,* whereas Pierre Bingen charges for the same bust in 1886 double that amount, i.e. four hundred Francs.[821] In 1882, the same François Rudier charges again two hundred Francs, this time for the casting of a *Bust of Jean-Paul Laurens,* with Gonon charging in the same year for the same sculpture three hundred fifty Francs.[822] In both these examples, the lost wax founders charge double or almost double the amount for the same type of sculpture, compared to sand mould foundries. Twenty years later, when Hébrard gives an estimate for the casting of the enlarged *Thinker,* the difference is even greater: twelve thousand Francs compared to the five thousand by the Alexis Rudier foundry.[823]

[820] Launay 1827, 181; Altmütter 1830, 165; Fesquet in Overman 1881, 258-259.
[821] Invoice 12 October 1883 in F. Rudier file MR. Invoice 16 November 1886 in Bingen file MR. Victor Hugo: bust with pedestal h. approx. 42 cm, see Le Normand-Romain 2007, 433.
[822] Invoice 23 April 1882 in F. Rudier file Rodin Museum, Paris Invoice 25 April 1882 in Gonon file Rodin Museum, Paris.
[823] le Normand-Romain 2007, 28.

5.3.3 The ideal of lost wax casting: the artist-founder and the founder-artist

The renewed interest into lost wax casting during the last quarter of the nineteenth century, is an interesting phenomenon with multiple angles. Until now, this thesis has covered mainly the technical aspects but there were also other factors at play at the time. The production of decorative bronzes in this period became almost industrialised with huge foundries employing hundreds of workmen.[824] These foundries, catering to the bourgeois taste, were producing in large quantities a great variety of, often cheaply made, bronzes. The technique enabling this production – sand mould casting – became synonymous with fast, cheap and often low-quality casting. Lost wax bronzes were considered to be the opposite of this. In an age characterised by historical revivalism, lost wax casting became associated with the great bronzes and founders of Antiquity and the Renaissance. Cellini, an artist who carried out the casting of his own work using the lost wax technique, was seen especially as the ultimate artist/craftsman. This was greatly assisted by the fact that Cellini wrote so vividly, confidently and detailed about his working methods.

In France, it was the artist Dalou who had a prominent role in the popularisation of lost wax casting, employing Gonon as well as Bingen to cast his monuments.[825] Whilst in exile, Dalou probably influenced British artists like Sir Alfred Gilbert (1854-1934) who, together with George Blackall Simonds (1843-1925), became instrumental in the re-introduction of lost wax casting of bronzes in Britain.[826] Gilbert had his first bronzes cast in Naples, Italy, in the early 1880s.[827] Back in Britain, Gilbert started to experiment himself, like a revival of Cellini, with lost wax casting.[828] The Italian influence in Britain continued with the setting up of the first lost wax foundry in London by Allessandro Parlanti, followed by the Singer and Thames Ditton foundries also introducing lost wax casting in their foundries.[829]

The artist perhaps engaging most with the lost wax technique around this time, is Medardo Rosso (1858-1928). Born in Turin and trained in Milan, Rosso spend some time in 1884 in Dalou's workshop in Paris where he befriended Rodin. Considering his Italian background, it is likely that he was already familiar with lost wax casting although it is not inconceivable he was also inspired by Gonon and Bingen who were both working for Dalou. Rosso's work has often been associated with that of Rodin, both modelling in a similar sketchy modern style. The interesting difference between the two artists is their use of bronze casting techniques. While Rosso experimented personally with lost wax casting, like a true Renaissance artist, Rodin in contrast, left the production process to professional moulders and founders. This enabled Rodin to create a huge oeuvre and production compared to Rosso's very modest

[824] Foundry work during this period was still very much handwork; the piece-moulding in sand was never carried out by machines.
[825] Lebon 2012, 94-132.
[826] Ibid, 102 note 190. Simonds was a staunch promotor of what he called the waste wax process. He did this by giving numerous lectures and writing several articles on the subject, see Simonds, 1886 and 1896.
[827] The foundry of Sabatino de Angelis: James 1986, 23.
[828] Ibid 24.
[829] For a detailed of the Parlanti's working methods; Parlanti, E.J. *Casting a Torso in Bronze by the Cire Perdue Process*, Alec Tiranti, 1953. For more on the Singer and Thames Ditton foundries, see James 1986, 24.

oeuvre, although of course other factors are also at play that contributed to Rodin's success as sculptor.

Another sculptor, promoting the use of lost wax casting, was the American Paul Wayland Bartlett (1865-1925). Son of the American sculptor and art critic Truman Howe Bartlett (1835-1922), he spent most of his life in Paris where he had his own studio/lost wax foundry. While his father was instrumental in the introduction of French artists such as Auguste Rodin in the United States, son Paul did a similar thing for lost wax casting in the U.S.[830] Paul Bartlett claims to have invented his way of lost wax casting: *"*to have found it [lost wax casting] through repeated experiments and combinations of different earthy substances, after reading all there was to read on the subject.*"*[831]

Bartlett's working method however, is almost identical to Bingen's technique whereby the wax model is made by pouring wax between a cut back core and the outer piece-mould.[832] It is likely that Bartlett acquired this intimate knowledge of lost wax directly from Bingen, to whom he was introduced to by his tutor Carriès in the early 1880s.[833] Bartlett, in turn, introduced Bingen to American Gorham Foundry in Providence, Rhode Island, to further develop their lost wax casting division.[834] The appreciation of founders and lost wax founders in particular, changed in the course of the nineteenth century. An early example of this is the petition for Eugène Gonon around 1876, to preserve his knowledge of lost wax casting for France. And when Pierre Bingen was interviewed in 1890, about his recent work on the monument for Eugène Delacroix by Dalou, the article is titled *Un artiste*, placing the founder at equal standing with artists.[835] Vauxcelles article from 1905, on the lost wax foundry

[830] Albert Elsen credits Truman with writing "One of the most detailed and objective accounts of [Auguste] Rodin's life and art before 1889 ... [Bartlett] not only conversed at length with the artist, but seriously researched his subject among newspapers and periodicals and he interviewed the sculptor's contemporaries." See Elsen 1965, 1

[831] Anonymous, '"Lost Wax". A Visit to Paul Bartlett's Studio." *New York Daily Tribune*, Sunday September (1895): 23. (The date of August 20 given in Adil & De Phillips (1991) is the date of the interview and not the newspaper article)

[832] "From the model in clay a plaster cast is taken in the ordinary way. This plaster cast is scraped or pared down slightly, and is then called the core. This core is put back into the mould (which, being in sections, can be taken apart and put together at will). Over the core a new impression is taken in wax, which thus replaces the surface part of the core, that had been pared off, and reproduces exactly all the niceties of the mould, taken from the original model. This wax model is then retouched by the artist."; Anonymous 1895, 23. For more on Bingen's technique sub-chapter: *5.3.4 The lost wax cast Ionides Thinker: Bingen or Gonon?* In this thesis.

[833] Adil and De Phillips 1991, V.

[834] Bingen however, was not very willing to share his secrets with the Gorham founders and his American adventure was short lived as was the use of lost wax founding of bronze sculpture at Gorham: Conner, Jannis. "Harriet Whitney Frishmuth and Her Founders." *Sculptured Motion: The Sculpture of Harriet Whitney Frishmuth* Hohmann Holding LLC (2006): 57.

[835] This monument can still be found in the gardens of Palais du Luxembourg in Paris. For the article see Huret, Jules. "Un artiste: a propos du monument d'Eugène Delacroix." *L'Écho de Paris*, 7 October (1890): 2. A partial transcription of this article can be found in Lebon 2003, 113-115. Lebon's transcription was probably based on an incomplete and undated newspaper clipping of this article in the Bingen file at MR. In the course of this investigation I have been able to trace the complete article, which can now be dated to 1890. In the article Bingen also states that he has been running his own foundry business for ten years. The dating of this article provides now a more secure date for Bingen's working period in Paris starting in 1880 and finishing in 1904. (The full article can be found in appendix 4)

Hébrard, is almost equally laudatory about the founder and its casting method.[836] Eugène Rudier, in contrast, has to wait until 1936 before an article appears about him, focusing mainly on the artists he worked for and with very little information on his working methods.[837]

5.3.4 The lost wax cast Ionides *Thinker*: Bingen or Gonon?

In preparation for the exhibition in 2011 on Rodin's *Thinker* in the Singer Museum Laren, an intriguing discovery was made. This exhibition, which centred around the recently restored bronze from the Singer Museum, brought together some very important early casts of this sculpture and gave a unique opportunity for comparison. Present in this exhibition was the very first bronze cast of the *Thinker* (1884) from the National Galleries of Victoria in Melbourne (fig. 5.14). When studied prior to installation, this bronze turned out, surprisingly, to be a lost wax casting, whereas all the subsequent later casts of the original size *Thinker*, and actually the vast majority of bronzes produced during the course of Rodin's lifetime, were cast in sand moulds. So why did Rodin choose to have his first bronze *Thinker* cast using the lost wax method? To answer this question, one has to go back to the early 1880s. In July 1880, Rodin received a monumental commission to design the entrance doors for the future museum of decorative arts, planned by the French state. Rodin was then still relatively unknown and started to work on this commission with great vigour. By the end of 1881 he had worked out the general composition of the doors and surrounding frame. This portal, later called *Gates of Hell*, was inspired by the Inferno, the first part of Dante Alighieri's *Divine Comedy* (ca. 1308-1321). Placed in the centre of the tympanum was the figure of Dante himself.

Among the many supporters of Rodin's work in England was the art critic William Ernest Henley (1849-1903). Upon hearing of the exciting progress Rodin had made with the *Gates of Hell* he requested photographs of the work from the artist. Henley showed these photographs to the Anglo-Greek collector Constantine Alexander Ionides (1833-1900) in November 1883 and it was not long after that, that Ionides commissioned a bronze cast of Dante for the considerable sum of four thousand Francs. In April 1884 Ionides, writing to Rodin about where he is going to display the bronze in his house, mentions the name *Thinker* for the first time: "I'm thinking of placing your thinker on a round table in the reception room where it can be seen from all sides"[838]

[836] Vauxcelles 1905, 189-197.
[837] Paul Moreau-Vauthier 1936, 203.
[838] Blanchetière François and David Thurrowgood. "Two insights into Auguste Rodin's The Thinker." *Art Journal of the National Gallery of Victoria* (52), (2013): 45.

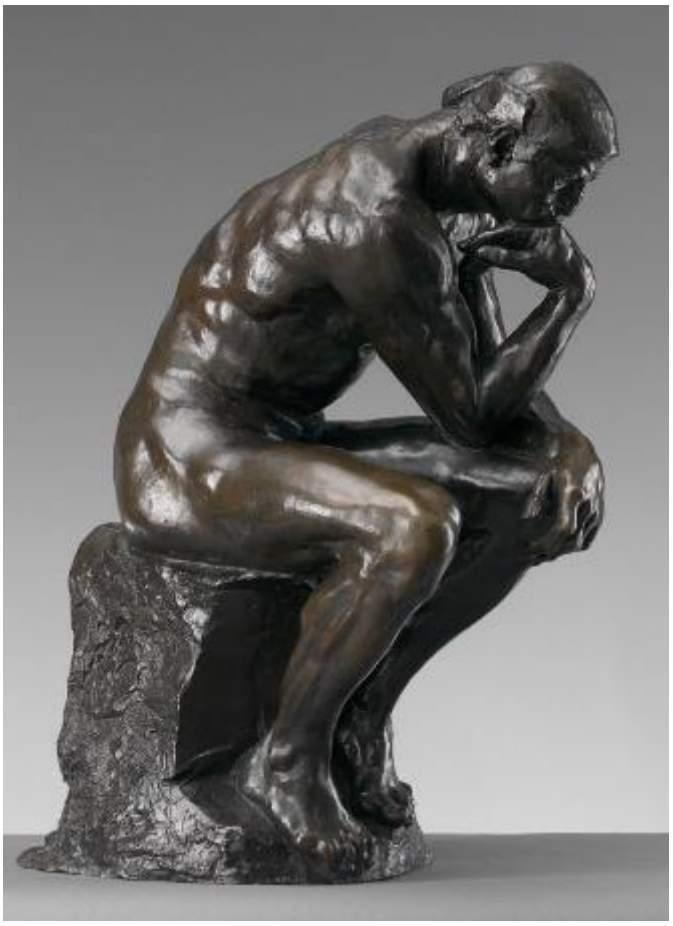

Fig. 5.14. Auguste Rodin *The Thinker* (1881–82), lost wax casting 1884, National Gallery of Victoria, Melbourne, Felton Bequest, 1921 (inv.no. 1196-3). (image National Gallery of Victoria, Melbourne)

Ionides kept the sculpture, the very first bronze cast of the *Thinker*, in his private home and when the bronze was sold, in 1921 to the National Galleries of Victoria in Melbourne, it sat for years quietly in the gallery, unknown to most of the Rodin scholars. This changed when Albert Elsen (1927-1995) studied the bronze in 1984. At first, the renowned Rodin scholar dismissed this *Thinker* because of some differing features in details of the modelling, but soon had to retract his statements when confronted with the watertight provenance of the bronze.[839] The Ionides cast is the only *Thinker* which, up till now, has not been convincingly attributed to a specific foundry. Of the many art foundries in Paris, working around 1884, it is known that two and perhaps four were capable of casting bronzes with the lost wax method, as all the other foundries were casting exclusively in sand moulds.[840] These foundries are Eugène Gonon, Pierre Bingen, and perhaps Thiébaut frères and Gruet Jeune.[841] Rodin commissioned all of them for a short period in the early 1880s, with documentary evidence of Eugène Gonon producing some bronzes for Rodin between 1882 and 1885, Bingen between 1884 and 1889, Thiébaut frères from 1880 and Gruet Jeune between 1880 and 1883.[842]

[839] Blanchetière and Thurrowgood 2013, 43.
[840] Lebon 2003, 269.
[841] See also sub-chapter 2.7 *The lost wax casting of bronze sculpture in the nineteenth century* in this thesis.
[842] Vassalo 1992; entry Gonon in *Liste des fondeurs*.

Although Gruet Jeune and Thiébaut Frères were commissioned by Rodin from 1880 to cast bronzes for the sculptor, it is very likely that the bronzes they produced in early 1880s were still made using sand moulds, for example the *Bust of St. John the Baptist* (RMP S.6670) from 1880, which is a sand mould casting and clearly marked by the foundry.[843] The evidence we have for lost wax castings by these two foundries is for later in the 1880s, namely 1887 for Gruet and 1889 for Thiébaut Frères.[844] This makes it very unlikely that the Melbourne *Thinker* was produced by Gruet or Thiébaut Frères, narrowing the possible candidate founders to either Gonon or Bingen. There is of course another possibility that an unknown lost wax foundry, used by Rodin and not marking their bronzes, was active in Paris around 1884. This is a rather unlikely scenario, because that would mean that this unknown foundry, capable of casting quite large sculpture and working for a well-known sculptor, left no trace watsoever. This is rather unlikely because the Rodin archive, which has a very extensive correspondence with foundries, has no evidence at all of such a foundry. In addition to this, Lebon gives no indication of this foundry in her publications and personal communication.

Blanchetière, attributes the Ionides *Thinker* to Gonon, based on the fact that Bingen systematically marked his casts and Eugène Gonon did not.[845] Lebon however, is inclined to see Bingen as the founder of the Ionides *Thinker*, because by 1884, Gonon was very busy with the monumental relief *Mirabeau répondant à Dreux-Breze* by Dalou (fig. 5.15).[846]

Why Gonon did not consistently mark the products of his foundry, is not known. An example of an unsigned cast is the *Idylle d'Ixelles* from Rodin Museum, Paris (inv.no S.978) which is firmly attributed to Gonon but not marked by the founder with foundry name.

[843] Bronze examined personally, together with Jean Dubos and Francois Blancetiere on 2-4-2012.
[844] For Gruet see Shapiro 1985, 116 and for Thiébaut Frères see Lebon 2003, 246.
[845] Blanchetière and Thurrowgood 2013, 45.
[846] Email communication with Lebon on 18-12-2011. Gonon worked on this huge relief from 1883 till 1889 which can be found today in Casimir Perier room at the Palais Bourbon in Paris; Hallopeau, A. "Le bas-relief de la chambre des Députés – Mirabeau et le marquis de Dreux-Brézé : 23 juin 1789.", *Le Génie civil*, 17 octobre 1891. Tome XIX, No 25, (1891): 399- 406, pl. XXVII. Collections électroniques de l'INHA, http://inha.revues.org/3634, [accessed 22 June 2018]

Fig. 5.15. Jean-François Raffaëlli, *Chez le fondeur*, 1886. Oil on canvas. Eugène Gonon, on the left, is depicted giving directions for moulding, in preparation of the casting of the monumental relief *Mirabeau répondant à Dreux-Brézé* by Jules Dalou. A plaster cast of this sculpture was exhibited at the Salon of 1883. (image Musée des Beaux-Arts, Lyon.)

It bears, though, the stamp DB DB 431, which is very similar to the stamp DB (or OB) 131 which can be found on the 1883 *Ugolin* group (fig. 5.22) by Gonon, which is additionally signed E. Gonon. Perhaps time restraints did not allow for the application of the signature or maybe Gonon was not entirely happy with the quality of the cast and did not wish to be associated with it.

Since there is no further documentary evidence giving weight to either a Bingen or a Gonon attribution, one has to look at the technical evidence the surviving bronze can provide. This art technological research examined the casting features of the bronzes as well as the alloy composition.

5.3.5 Casting features of Gonon and Bingen bronzes

Part of the recent conservation work to the Melbourne *Thinker*, in preparation for the Laren exhibition, was the removal of a later plaster filling in the base revealing, for the first time in living history, the interior surface of the bronze.[847] This finally created the opportunity to determine the casting method. The surface of the interior of the bronze displayed drip marks and a smooth surface, typical of indirect lost wax cast bronzes (fig. 5.16).

Fig. 5.16. A detail of the interior surface of the Melbourne *Thinker*, displaying the typical characteristics of an indirect lost wax cast bronze with drip marks and remnants of the plaster core.

The cleaning of the outer surface of the bronze revealed numerous small bronze spheres, particularly on the surface of the base. These raised spheres, with an average diameter of 1-2 mm, are typical for the use of liquid mould material, such as gelatine and plaster, in the lost wax casting process, whereby air bubbles are trapped in the surface of the mould (fig. 5.17).

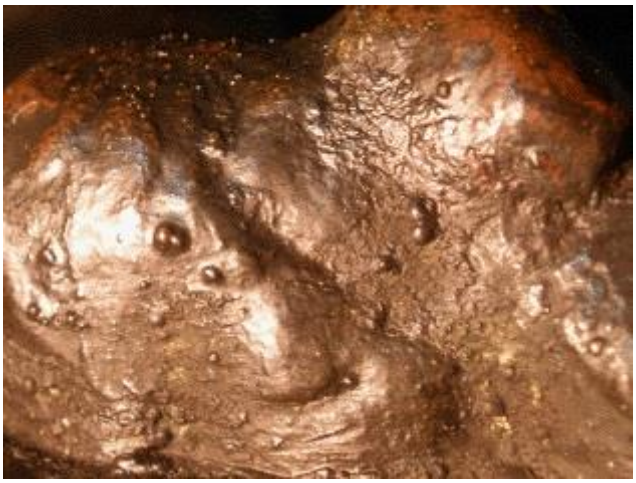

Fig. 5.17. Exterior surface detail of the base of the Melbourne *Thinker* illustrating the raised spheres, evidence of porous gelatine and plaster moulds, as used in the lost wax casting process.

[847] Blanchetière and Thurrowgood 2013, 47.

When the interior of the Melbourne *Thinker* is compared with the interiors of other lost wax bronzes cast by Gonon and Bingen, a strong resemblance with the Gonon lost wax castings of that period can be observed. The most striking feature is the white plaster-like surface residue on the interior surface (fig. 5.18). Two distinctly different types of plaster can be observed: white plaster close to the edge of the base and yellowish stained plaster deeper in the sculpture. The latter one is the original core material, whereas the first are the remains of the later plaster infill, that was removed during the last conservation treatment. Gonon is known to have used plaster-based cores in his lost wax castings, for example in his treatise on lost wax casting from 1876, he gives the following recipe for cores:[848]

- terre cuite, 2 mesures (terra-cotta, 2 parts)
- sable de Belleville, 1 mesure (sand from Belleville, 1 part)[849]
- plâtre à mouler, 2 mesures (moulding plaster, 2 parts)

Fig. 5.18. Interior view of the Ionides *Thinker* showing the plaster-based surface deposit on the inside of the bronze. National Gallery of Victoria, Melbourne.

Similar white plaster-like surfaces can also be observed on bronzes by Gonon such as *Idylle d'Ixelles* (fig. 5.19) and *Ugolin et ses enfants* (fig. 5.21).

[848] Lebon 2012d, 38.
[849] Gonon regards this sand as the best: "Le sable de Belleville est réellement supérieur à celui des autres localités" see Lebon 2012d, 38.

The drip marks, typical for indirect lost wax casting, have already been discussed in the previous paragraph, but there is another feature characteristic for the manufacture, which can be observed on this bronze.

Fig. 5.19. Interior view of *Idylle d'Ixelles* (Rodin Museum, Paris)

Fig. 5.20. A. Rodin, *Idylle d'Ixelles* (1875-1885). Bronze, lost wax casting by Gonon in 1885. (H. 53 cm; L. 41 cm; D. 41,5 cm) Rodin Museum (inv.no. S.978) (image Rodin Museum, Paris)

Fig. 5.21. Interior view of *Ugolin et ses enfants*, private (image Sotheby's New York)

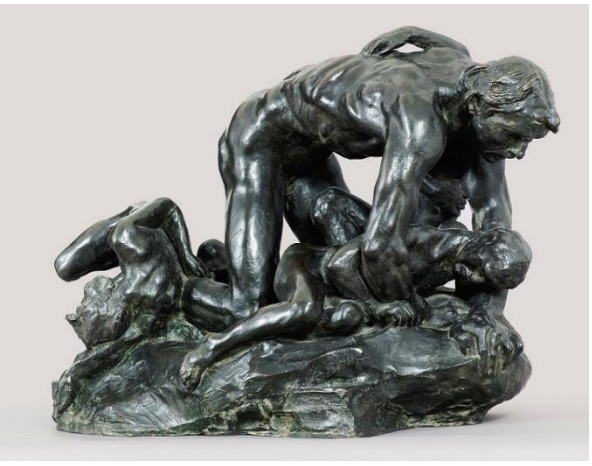

Fig. 5.22. A. Rodin, *Ugolin et ses* collection *enfants*, conceived in 1882 and cast in 1883 by Eugène Gonon. (L. 56 cm) Private collection. (image Sotheby's New York)

Close examination of the interior surface of lost wax cast bronzes, such as the Ionides *Thinker* (NGV Melbourne) and the *Idylle d'Ixelles* (Rodin Museum, Paris inv.no S.978), revealed a specific type of foundry patch sometimes referred to as a cold patch.[850]

Fig. 5.23. Detail of the interior of the skull of the Ionides *Thinker* (NGV Melbourne) showing the plugged lantern hole.

Fig. 5.24. One of the four plugged lantern holes in the *Idylle d'Ixelles* (Rodin Museum, Paris, inv.no. S.978)

The plugged holes of this type of lantern hole display a typical square appearance, with rough edges on the interior of a bronze (figs. 5.23 & 5.24).[851] This can be explained by the fact that the lantern in this case was covered with clay, especially in the area where the lantern would run the risk of coming in contact with the molten metal.[852] The layer of clay would have two functions: firstly to prevent molten metal flowing into the lantern and thus blocking the escape route for the core gases and secondly to act also as a spacer keeping the core from moving. The clay surrounding the lantern would be given a square shape because a square form of the hole would be easier to prepare for plugging with a flat chisel (fig. 5.25).

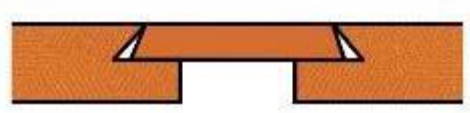

Fig. 5.25. Schematic drawing of a cross section of a cold patch. (illustration V. Veenemans)

The French term for this square plug is *portée.*[853] Figure 5.26, of the newly cast and unfinished lost wax cast monumental *Thinker* in the Hébrard foundry, clearly illustrates this use of a lantern.

[850] Harry Jackson gives in a series of photographs the procedure for the application of a cold patch in his book, see Jackson 1972, 94-97.
[851] For more on lanterns or core vents, see sub-chapter 2.2.3 *Launay and the first manual* in this thesis.
[852] In addition to the square plugged lantern patch one can observe in the *Idylle d'Ixelles* and the *Bathsheba* for each of them also square plugged holes in the base. These were probably not plugged lantern holes but plugs without lantern or other core irons, acting as spacers in refractory material to keep the core and outer mould spaced at equal distance.
[853] Personal communication with Christophe Bery from the Coubertin foundry. For more on *portées*; Guettier 1858, 264-265. The phenomenon of *portées* is outside the scope of this thesis but deserves more thorough future research.

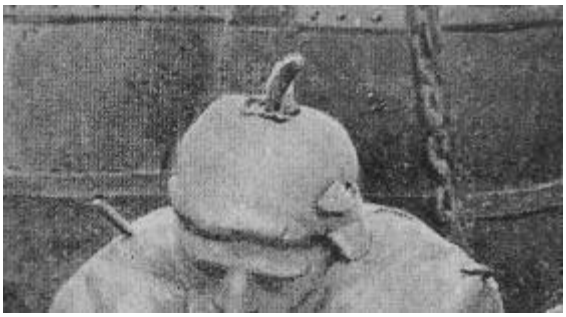

Fig. 5.26. Detail of the monumental lost wax cast *Thinker* at the Hébrard foundry in Paris. The bronze is unfinished with the lantern still protruding from the top of the skull and other core-irons sticking out from the shoulders. (from *La Vie illustrée* 8 July 1904)

This type of foundry patch is, however, not a unique feature of nineteenth and early twentieth century bronzes because this has also been observed, during the course of this study, on a seventeenth century lost wax cast bronze Bathsheba, on the art market in 2012.

Another feature which can be used to distinguish between Bingen and Gonon is the surface of the metal inside the bronze. The interior surface of Bingen's lost wax castings show a characteristically different surface (figs. 5.27, 5.28 & 5.29).

Fig. 5.27. A. Rodin; *Bust of Victor Hugo* (reduced version), 1885. Bronze, lost wax casting by Bingen (marked *Bingen. Fondeur*) in 1886. H. 39 cm (incl. base); L. 18 cm; D. 17.7 cm. Rodin Museum, Paris (inv.no. S.497) Image on the left giving interior view of the bust

This surface is more akin to a sand mould cast surface and this can be explained by Bingen's special lost wax casting technique using a pre-shaped core.[854] This interior surface, typical for

[854] Boulton in D. Kosinski (ed.) 2007, 94 note 76.

Pierre Bingen bronzes, can also be observed on for example the Bingen cast of Augustin Jean Moreau-Vauthier's (1831-1893) *bust of George A. Lucas* in the Metropolitan Museum of Art in New York (fig. 5.28) and Rodin's *Crouching woman* from 1885 in a private collection (fig. 5.29).[855]

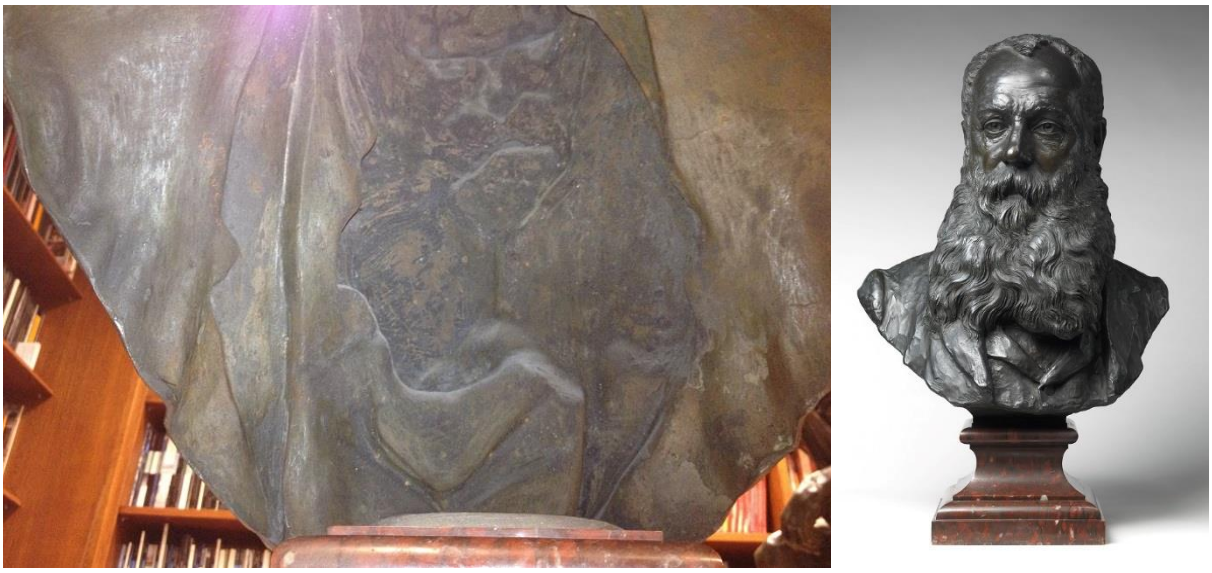

Fig. 5.28. Augustin Jean Moreau-Vauthier, *bust of George A. Lucas*, 1890. Bronze lost wax casting by Pierre Bingen (marked *cire perdue P. Bingen Fondeur*). H. 50.3 cm; W. 41.6 cm; D. 29.4 cm. Metropolitan Museum of Art, New York (Acc. No.: 91.7). (image on the right, Metropolitan Museum of Art, New York)

Fig. 5.29. A. Rodin, *Crouching woman*, conceived 1881-82. This lost wax casting by Bingen from 1885 illustrates the deceiving sand moulded appearance of the interior of the base., H. c.32 cm, private collection. (image Jerome le Blay)

[855] Metropolitan Museum of Art, New York: Acc. No.: 91.7

Not only the interior, but also the exterior of the lost wax bronzes by Pierre Bingen, appear to be markedly different from a technological point of view, compared to Gonon bronzes.

Bingen bronzes show a large degree of after-work in the wax whereby extra detail is added, a feature which is much less observed on Gonon bronzes from this period. This can be explained by the specific moulding and casting technique used by Bingen, of which we have a description when Jules Huret interviewed Bingen and questioned him about his working method.[856] In this newspaper article, he gives a detailed account which can be summarized as follows: upon delivery by an artist of his model, the founder Bingen would carefully make a copy of this model in a material referred to as *terre*.[857] The next step was to fire (*cuire*) this clay model, this would probably be a low temperature firing otherwise this would mean that the clay would be converted into terra-cotta. High fired terra-cotta model is not very suitable as a core because it does not possess the ability to contract when the surrounding metal shrinks but more importantly the hard, brittle, terra-cotta does not lend itself to scraping off an even layer from the surface. The material *terre* was probably either a clay with a high sand content or a sand with a substantial clay content, akin to moulding sand used for sand mould casting. Upon close study of surviving bronzes by Bingen from this period this core material, which looks remarkably similar to natural moulding sand, can still be found in recesses in the interior of the sculpture (fig. 5.30).

Fig. 5.30. Interior view of the reduced bust of *Victor Hugo* (Rodin Museum, Paris, inv.no. S.497). Left image showing remnants of reddish moulding sand. The right image illustrates the charred traces of burned sand together with core pins.

The next step by Bingen would be to cover this reduced core with a thin layer of wax of the desired thickness of the bronze. This wax model with a core of sand, was now lacking surface details, and had to be reworked by the artist.[858] This reworked wax was then covered by Bingen with a series of successive layers in clay, and subsequently fired and processed in the

[856] Huret 1890, 2.

[857] This is somewhat surprising, since he is later described as being “irascible, greedy, and utterly disinclined to share his knowledge”, see Conner, Janis. “After the Model: Bessie Potter Vonnoh's Early Bronzes and Founders.” *Bessie Potter Vonnoh: Sculptor of Women*. Aronson, Julie (ed), Cincinnati Art Museum (2008): 240.

[858] The surface of the base of bust of *Victor Hugo* (Rodin Museum, S. 497) appears to contradict this working method as it displays a wood grain texture probably deriving from the use of a wooden model for this base.

usual manner for an indirect casting. Bingen's moulding technique is similar to a moulding technique described in Biringuccio's *De la Pirotechnia* (Venice 1540):

> There are some others who, because they wish to make the bronze statues hollow and equally thin all over (wherein lies the whole difficulty), make a core of moulding clay finished exactly as they wish their statue to be, and bake it. When it is baked, they cut away a layer of the thickness that they wish the bronze to have and replace this in wax. To do it better, they cut it away part by part and replace with wax the amount of clay taken off, thus returning their figure in wax to its previous shape in clay.[859]

It is conceivable that Bingen got his inspiration from this publication, although with Bingen's method, the wax is cast between the cut-back core and the piece-mould used to make this core. The technique described in Biringuccio is a form of direct casting, whereas Bingen's method is a form of indirect casting, whereby the original artist model is not lost in the process. However, one wonders what is regarded as the artist model with Bingen's moulding technique since most of the details are (re)produced in the wax. As a result of this method, Bingen's bronzes display a remarkable fine surface. Certain surface defects such as the raised spheres, found on the Melbourne *Thinker*, have to date, not been observed on his bronzes. When describing his technique to Huret, Bingen does not mention the use of gelatine moulds. Gonon, however, does describe using gelatine in his treatise of 1876.[860]

In this respect it is interesting to look at the often-used terms, direct and indirect casting. The terms direct and indirect casting are basically not correct because the difference between the two techniques is in the moulding process and not the casting itself. In the modern foundry industry indirect casting is used to denote different foundry processes: it can refer to the casting of a half-product such as a billet which will be processed further, while direct casting is used for casting a shape very close to the end product, requiring very little further processing (nearnet-shape casting).[861] Because the term direct and indirect casting, as used in art technological writings, basically refers to the moulding process, I propose therefore to use the term direct and indirect moulding instead.

Although Bingen's bronzes are usually very detailed casts, their method of production not only required the artist to redo the modelling but also, by its very nature, it was a slow process, producing one-off pieces. For an artist such as Rodin, with an increasing popularity and a demand for multiple casts of the same model, it would be impossible for a foundry such as Bingen to supply sufficient castings in reasonable time. For the artists too, Bingen's

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[859] Translation Smith and Gnudi 1959, 230-231. "Alcuni altri sono che per uoler sar le figure di bronze uacue equali, per tutto sottili, che in questosta tusta la difficulta sanno un maschio di serra da forme. A ponto à ponte finito come uogliano che la lor figura sia, lo ricueceno, ricotto gli tagliano una pelle di sopra di tanta groβezza quanto uogliano che di bronzo uenga, la vimetteno di cera et perfarmeglio la tagliano à parte à parte, tanto ui tornano di cera quanto n'ha leuato di terra, cosi ritornano la figura lor di cera come uel fuo prima eβer era di terra, sopra allaquale cosi finita metteno il luto, e fan la forma,…"; Biringuccio 1540, 178.

[860] See sub-chapter 3.3.4 *Gelatine moulding* in this thesis.

[861] Anonymous; *Direct casting for iron and steel sector* [online] Available at: < http://www.climatetechwiki.org/technology/direct-casting >, [accessed 1 June 2018].

technique was very labour intensive, requiring for every casting, the additional task of retouching the wax, a job one can understand Rodin would not have looked forward to, or even had the time for.

5.3.6 Alloy composition of Gonon and Bingen bronzes

Compositional analysis of samples using ICP-MS

In addition to the above-mentioned casting and moulding aspects of Gonon and Bingen bronzes, an investigation was carried out into the alloys used for these bronzes. The premise of this study was to find out whether the Bingen and Gonon foundries used a foundry specific alloy and whether the alloy of the Melbourne *Thinker* would be consistent with one of these foundries. Bronzes of similar size and date of the Melbourne cast, by Gonon and Bingen, were selected in accessible public collections. This was a relatively small group of bronzes partly due to the small output of these foundries combined with the fact that bronzes of this period are for a substantial part still in private collections.[862]

The samples were analysed using the ICP-MS technique. Inductively Coupled Plasma Mass Spectrometry is an analytical technique used for elemental determinations by combining a high-temperature ICP (Inductively Coupled Plasma) source with a mass spectrometer. The plasma ionises the atoms of the elements and these ions are then detected by the mass spectrometer. It is generally preferred over XRF analysis for the analysis because of its higher accuracy and lower detection limits. The disadvantage of ICP-MS is, apart from its relatively high cost, the necessity of sampling the object. This requires the removal of original material from the object and owners of historic objects are not always willing to give permission for this. Multiple samples, two to three, were taken from one sculpture for analysis at the Vrije Universiteit van Amsterdam. The small number of sampled bronzes is not ideal for a comparative study and it is realized that this study is limited by this and must be seen more as an indication than conclusive evidence.

Six bronzes were included in this study: the Melbourne *Thinker*, two bronzes which are generally ascribed to the founder Gonon (Kissing *Babes* from Melbourne and *Idylle d'Ixelles* RMP*)* and two bronzes cast by Bingen (Victor *Hugo* RMP and *George A. Lucas* MMA)
The ICP-MS measurements of the Rodin samples in this study measurements were performed using a MAT-Finnigan 262 RPQ-plus multicollector mass spectrometer (Finnigan Corp., San Jose, CA) at the Vrije Universiteit Amsterdam.[863]
The full analysis can be found in appendix 1, with a summary in table XV underneath.

[862] The number of Gonon bronzes exceeds probably not ten and for Bingen not more than ten to fifteen; Vassalo, Isabelle, *Rodin et ses fondeurs*, Université Paris I, MA thesis 1992; Bingen and Gonon in *Liste des fondeurs*.
[863] I am indebted to Richard Smeets and Gareth Davies of the Faculty of Earth and Life Sciences (FALW) Vrije Universiteit Amsterdam, who carried out the measurements.

Table XV. ICP-MS analysis of samples by the Bingen and Gonon foundries and the Ionides *Thinker*.

object	collection	Inv.no.	Foundry	Cu (wt.%)	Zn	Sn	Pb	total: Cu,Zn,Sn,Pb
Thinker (1884)	NGV Melbourne	1196-3	Unknown	85.14	10.18	3.20	0,79	99.31
Kissing Babes (1883)	NGV Melbourne	1197-3	Gonon?	91.24	7.22	1.03	0.24	99.73
Idylle d'Ixelles (1885)	Rodin Museum (Paris)	S. 978	Gonon	87.25	9.91	1.72	0.54	99.42
Victor Hugo (1885)	Rodin Museum (Paris)	S. 497	P. Bingen	95.68	1.49	2.16	0,28	99.61
George A. Lucas (1890)	MMA (New York)	91.7	P. Bingen	92.61	4.81	1.63	0.24	99.29

In this table, only the major elements are summarised; copper, zinc, tin and lead. The largest constituent, copper, is for Gonon slightly lower but not significantly enough to act as a discriminating factor. This is also applicable to the lead and tin components.[864] Zinc however is distinctly higher in Gonon bronzes than in Bingen bronzes. The zinc content of the Melbourne *Thinker* is much closer to the Gonon bronzes, especially the *Idylle d'Ixelles*, and more than double that of the Bingen bronzes. The similarity of the Melbourne *Thinker* alloy composition with Gonon bronzes is noticeable, however, Gonon's alloy is fairly typical for late nineteenth and early twentieth century bronzes and it is really the difference with Bingen's more a-typical alloy that is significant.[865]

The case for Gonon as the founder of the Ionides *Thinker* can be summarized with the following points:

- Bingen consistently marked his casts whereas Gonon did not
- the wax model for the Ionides *Thinker* was slush cast in a gelatine mould; this was standard foundry practice for Gonon and not for Bingen
- the core material of the Ionides cast is plaster-based, this was at that time standard foundry practice for Gonon and not for Bingen
- the alloy of the Ionides *Thinker* is closer to the Gonon alloy than the Bingen alloy

[864] Tin showed great variations between the various samples within the bronze they were taken from. See appendix 1

[865] I would like to thank Arie Pappot for pointing out similar alloys used for bronzes in the Rijksmuseum collection, such as: BK-18771-A en B: George Gardet, 1890?; BK-NM-11391-1: Alessandro Castellani, 1875; BK-1982-65: Johan Altorf, 1919; BK-B-91: Charles van Wijk, 1906; BK-B-111: Toon Dupuis, 1900-1911.

5.4 Conclusion

While the previous chapter 4 looked at the making process and the characteristics it produced on the bronzes, the above chapter builds on this knowledge to interpret, explain and reflect on technological features of Rodin bronzes in general and *Thinkers* specifically. Through comparison it was observed that the castings produced by Eugène Rudier share great technical similarity with Griffoul castings and a marked difference compared to the bronzes produced by his uncle François Rudier. A possible explanation for this is that Eugène Rudier or one of his foundry men acquired some of their bronze moulding and casting skills from father or son Griffoul, via the connection of his uncle François Rudier, once the business partner of father Griffoul.

A comparison study was also instrumental in establishing the possible founder of the Ionides cast. This first ever bronze cast of the *Thinker* has always been a sort of enigma. The only lost wax casting of this sculpture, and lacking foundry mark or documentation to attribute it to a specific foundry. Two founders have been suggested as likely candidates by art historians in the past, namely Pierre Bingen or Eugène Gonon. Through analysis of the art technological features of this bronze and comparison with other bronzes by these founders, Eugène Gonon was identified as the most likely founder of the Ionides cast.

When Rodin started, in the mid-1870s, to commission foundries to cast his first bronzes, sand mould casting was the pre-eminent founding method for bronze sculpture. As a result, these first Rodin bronzes were cast using sand moulds. Around this time however, a renewed interest emerged in lost wax casting, which, according to contemporary art-critics, was the preferred method for reproducing fine art sculpture. They argued that only this founding technique, used to produce the great bronze sculptures of Antiquity and the Renaissance, was suitable to reproduce the work of modern master sculptors. This prompted several artists, Rodin amongst them, to have, around 1880, their work reproduced in bronze using the lost wax technique. From 1882 Rodin, who never performed his own castings, used the Gonon and Bingen lost wax foundries until 1886. This was Rodin's first period of using lost wax founders and was ended for several reasons. One of the reasons was that Rodin popularity as an artist increased in this period and resulted in more commissions for bronzes. The artisanal nature of lost wax casting resulted in a long production process of these two foundries and limited the output of these lost wax foundries, resulting in long delivery times for Rodin bronzes.

The quality of the casts might have been another issue for Rodin. Even though Gonon and Bingen were using both lost wax casting, their methods differed considerably, resulting in a difference in the quality of casting, with the surface detail rendering of Bingen castings being superior to that of Gonon. The very detailed surface of Bingen bronzes was, however, the result of a second modelling of the wax, which Rodin could hardly have enjoyed.

Three times during his career Rodin was willing to try out lost wax casting, but every time he was disappointed and went back to the trusted sand mould casting. Apart from price (lost wax

casting was more expensive), quality of the castings and the reliability of the foundry, there might have been another motive for Rodin to prefer sand mould casting over lost wax casting: the aesthetic quality of a sand mould cast surface. It is conceivable that Rodin, with a background in stone carving, preferred the soft tactile surface of sand mould cast surface over a, too detailed, lost wax surface. The difference between the two surfaces is usually the type of detail and the extent of the undercutting of these surface details. This gives a sand moulded surface a less open and more solid appearance similar to a stone carved surface.