

FERROMANIA

- The establishment of cast-iron architecture in New York -

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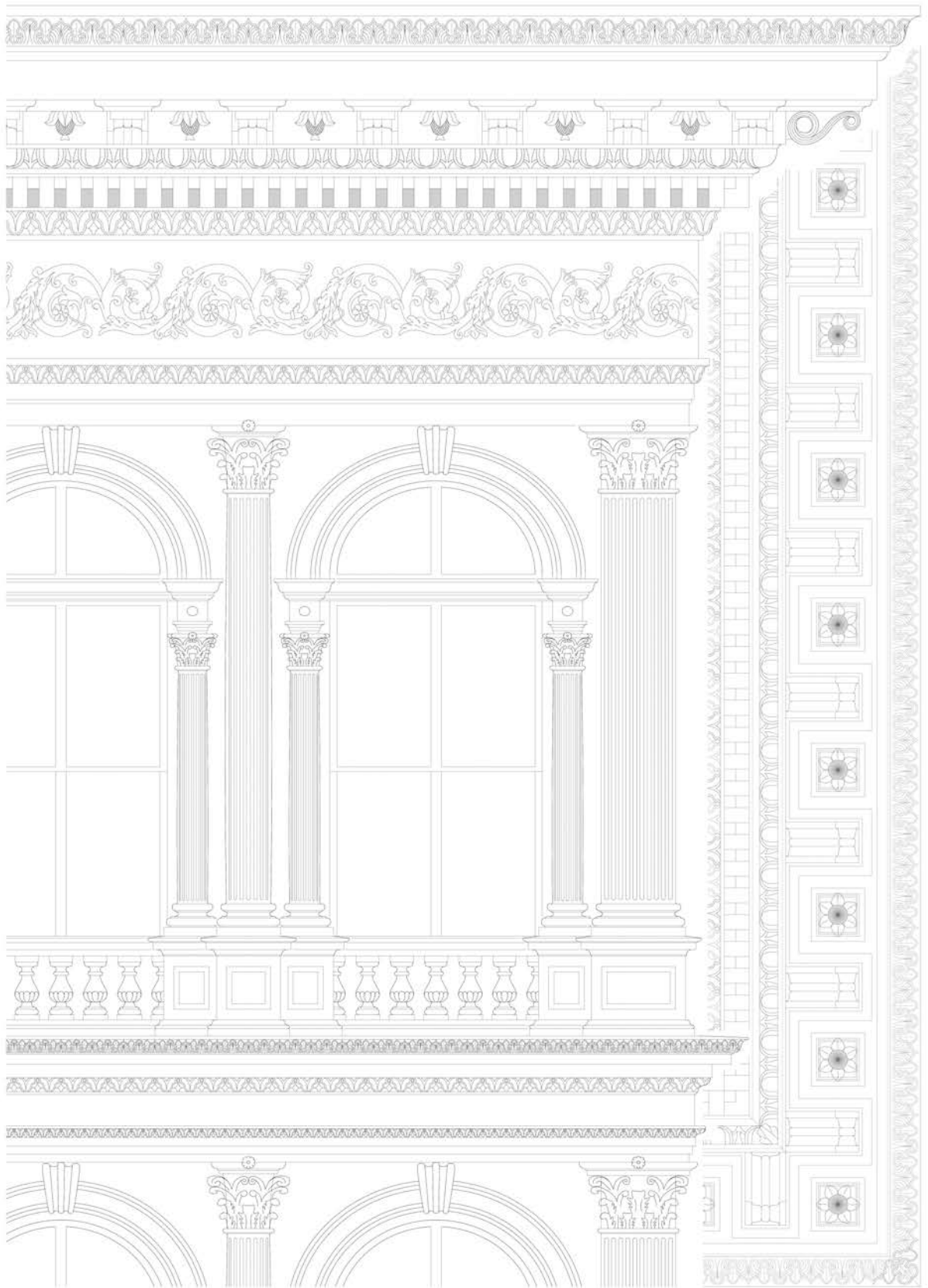


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1. INTRODUCTION

Around the middle of the 19th century a major shift occurred in the building industry in America. Cast iron became established and accepted as a building material over a wide variety of building types. Although the Crystal Palace, which was erected around the same time in London, may have been more spectacular and visionary in terms of prefabrication and repetitive facades than the examples in America, it wasn't able to have direct consequences in the broad everyday architecture. The development in America, although slower and probably less visionary than in Europe, however was able to involve the architects, the industry and the customers together in a collective euphoric "Ferromania", a suspension of the previous disbelief in the material's potential, which resulted in a great number of historicist cast-iron buildings. This paper will try to understand and comprehend the processes that led to the establishment of cast-iron architecture over a great range of building types in mid 19th century America and especially New York, which was a centre of population and economical growth and thus an ideal field for the development of innovations such as cast-iron architecture.

1.1 FOCUS OF THE RESEARCH

The research will therefore mainly cover the greater area around New York partly including Boston and Philadelphia. The period considered in the research includes primarily the 25 years from 1845 to 1870, which is the timespan from the appearance of the first full-iron facades in New York until the moment when cast-iron architecture reached its greatest popularity. The actual technical, economical and architectural development during this period, already traced by historians, will be related to legitimization strategies of cast iron proponents documented in written testimonies of the time, such as publications and newspapers, to understand the processes which led to the broad acceptance and application of the material.

1.2 HYPOTHESIS

The expanded production and use of cast iron was a result of the industrialization and therefore deeply intertwined with capitalist processes such as the introduction of divided labour. These shifts also affected and changed the building industry and the roles of its actors. New specialists and engineers emerged and the architects lost their dominant role as generalists. This was especially the case with cast iron because it was a material that required expert planning and a heavy industrial production process. Inventors and iron foundries with a profound knowledge of the material therefore drove its introduction. Although there have certainly been technical and economical reasons for the application of cast iron in architecture, there was a strong general scepticism towards the use of the new material. Practical fears of technical failures in combination with more emotional conservative concerns, urged the proponents of cast iron to legitimize its use. My hypothesis is that this act of legitimization was especially successful in America because it was accomplished by a combination of hard facts aiming at actual fears and seductive images touching the more emotional concerns. The fact that the proponents, such as the iron foundries, mostly had business interests and therefore an economical interest in the acceptance of the material, further suggests the assumption that this was a very conscious process of persuasion cleverly led by them. The paper therefore analyses the different strategies of legitimization and relates them to the actual proceedings on the way to the successful establishment of cast iron.

It will show eventually that the legitimization of cast iron towards a wide audience was largely dependent on skilful communication and advertisement of the cast iron pioneers in newly available media at that time. In the end the broad mass was overwhelmed by a combination of convincing technical and economical hard facts in combination with seducing drawings and architectural forms fitting the Victorian taste of the time.

1.3 ORGANIZATION OF THE RESEARCH

The paper starts with a general introduction on the topic of cast-iron architecture, especially showing the differences between the European and the American development (see chap. 2). It will explain the problems of establishing the new building material and the need for its legitimation by cast iron pioneers (see chap. 3). Since this mainly was a question of communication, we will then focus on publications and media such as the newly available newspapers of the time (see chap. 4 & 5). The active processes, which led to the successful establishment of cast-iron architecture, will be shown by an analysis of the texts and images of the most important contemporary actors. These published self-conceptions of the authors will simultaneously be related to their historical context and the compulsory reasons of development, which lay beyond their control. Patents operating at an intersection between technical, reputational and economical aspects will conclude the research (see chap. 6).

1.4 STATE OF THE RESEARCH

The two main publications from the examined period, namely the ones of the inventor James Bogardus and the foundry-owner Daniel D. Badger, acted as a starting point into my research.¹ Going on from there, I was able to draw on an extended research on the life and achievements of these two cast iron pioneers conducted by the historian Margot Gayle.² From her source material I learnt of other useful witnesses of the time, such as William J. Fryer who chronicled a lot of the proceedings in New Yorks building industry in the second half of the 19th century, and of several debates held around the introduction of the new material.³ An own newspaper research by means of online repositories broadened my view of the publicly discussed positions. My view on the age of cast-iron architecture was rounded off by the reports of the New York Landmark Preservation Commission and standard references to the history of the material such as the ones from John Gloag and Derek Bridgewater or Christian Schädlich.⁴ Based on this material I was able to trace the actual progress of events and to relate it to the critical and intercessional voices of the time to identify and understand the driving forces that eventually led to the establishment of cast-iron architecture in America. But it is a field that still is only sparsely examined and contains further open questions. For example it would be of interest to do further researches on the status of honesty and truth in iron construction, as well as on the formative influence of capitalist processes to architectural designs from this time onwards, as it was one of the first moments in history that a repetition of standardized prefabricated building parts, enabled by the means of industrial mass production, emerged in architecture.

¹ Bogardus, James: *Cast iron buildings: their construction and advantages*, J.W. Harrison Printer, New York, 1856

Badger, Daniel D.: *Illustrations of Iron Architecture Made by the Architectural Iron Works of the City of New York*, Baker & Godwin, NY, 1865

² Gayle, Margot in: *Badger's Illustrated Catalogue of cast-iron architecture by Daniel D. Badger*, Dover Publications, New York, 1981, AND

Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998

³ Fryer, William J.: *A history of real estate, building and architecture in New York City*, Record and Guide, New York, 1898

⁴ Gloag, John; Bridgewater, Derek: *A History of Cast Iron in Architecture*, Allen & Unwin Ltd, London, 1948, AND

Schädlich, Christian: *Das Eisen in der Architektur des 19. Jahrhunderts*, Geymüller Verlag, Aachen, 2015

New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973

2. THE AGE OF CAST-IRON ARCHITECTURE

To understand the establishment of cast-iron architecture in America, it is first of all necessary to specify and explain in which form cast iron was introduced to architecture in that geographical and historical context, as well as how this was distinct to the European case. This is important because the difference depended largely on the theoretical and aesthetical discussions of the time and is assumed to have led to a different architecture resulting in a bigger acceptance of cast iron in America.

2.1 THE EMERGENCE OF IRON IN ARCHITECTURE

Already Pliny the Elder mentioned iron as a material used in house building in ancient roman times. Though iron was only used as a secondary building material until up to the middle age.⁵ Usual applications in architecture were decorations, railings and fasteners, such as nails, hinges, straps, anchors and tie rods.⁶ Throughout the middle age it was used especially in masonry-works to anchor vaults and cupolas. Only after the middle of the 18th century iron was used as an independent structural material replacing stone or wood. The appearance of iron as a structural material was a result of the industrial revolution, the technical and socio-economical upheaval that eventually led to modern capitalism.⁷

Throughout the 18th century the major progress in the iron-industry revolved around the dynasty of Abraham Darby in Coalbrookdale in England over three generations. In the first half of the century Abraham Darby I introduced greensand moulds to cast iron and improved the production of pig iron in a blast furnace by using coke instead of charcoal. Abraham Darby II later turned to coal to produce pig iron in a better quality. These improvements in casting enabled the mass production of large-scale iron pieces.⁸ Accordingly, the first industrial revolution from 1750 onwards can be seen as a result of these improved methods of using iron and coal in combination with the introduction of steam power.⁹ Due to its availability in the second half of the 18th century iron started to be used for structural purposes in architecture. Under Abraham Darby III the foundry manufactured the world's first entirely cast-iron bridge, spanning the Severn River near Coalbrookdale in 1779.¹⁰ (see fig. 1) The expansion of the textile manufacturing industry in this period further enhanced the structural use of cast iron. The development of iron framing for English spinning and textile mills allowed conquering the danger of fire and limitations of heights. In 1792-93 William Strutt constructed the Calico Mill in Derby, the first multi-storey building in which brick-arches supported by cast-iron columns carried the floors.¹¹ Five years later in 1797 Charles Bage built the Ditherington Flax Mill in Shrewsbury using iron beams and columns, which is therefore assumed to have been the prototype of the iron framed building.¹²

In the first half of the 19th century the population of Britain doubled. It was a time of industrial expansion of the cast iron industry and the heroic age of British engineering. Railroads enabled the rapid transportation of heavy loads and the invention of the hot blast furnace for iron by James Beaumont Nielsen in 1828 expanded the capacity of iron foundries by increasing the heat and reducing the fuel consumption.¹³

⁵ Schädlich, Christian: *Das Eisen in der Architektur des 19. Jahrhunderts*, Geymüller Verlag, Aachen, 2015, p. 27

⁶ Gayle, Margot in: *Badger's Illustrated Catalogue of cast-iron architecture by Daniel D. Badger*, Dover Publications, New York, 1981, p. v

⁷ Schädlich, Christian: *Das Eisen in der Architektur des 19. Jahrhunderts*, Geymüller Verlag, Aachen, 2015, p. 27

⁸ Gideon, Siegfried: *Space, Time and Architecture*, Harvard University Press, Cambridge Massachusetts, 5th Edition, 1967, p. 169-170 & Cox, Nancy: *Imagination and innovation of an industrial pioneer: The first Abraham Darby*, in: *Industrial Archaeology Review*. 12 (2): 127-144 at 128, 1990

⁹ Gloag, John; Bridgwater, Derek: *A History of Cast Iron in Architecture*, Allen & Unwin Ltd, London, 1948, p. 159

¹⁰ Gideon, Siegfried: *Space, Time and Architecture*, Harvard University Press, Cambridge Massachusetts, 5th Edition, 1967, p. 169-170

¹¹ New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p. 16-17

¹² Gayle, Margot in: *Badger's Illustrated Catalogue of cast-iron architecture by Daniel D. Badger*, Dover Publications, New York, 1981, p. ix-x

¹³ Gloag, John; Bridgwater, Derek: *A History of Cast Iron in Architecture*, Allen & Unwin Ltd, London, 1948, p. 150-162

Around this time the English engineers William Fairbairn and Eaton-Hodgkinson invented the I-beam and were able to demonstrate how the tension-resistant wrought iron could best be used for beams, while the pressure-resistant cast iron was more suitable for columns.¹⁴

Until the 1850s, cast and wrought iron were the only ferrous materials available and commonly used for structural purposes.¹⁵ Although both are made from pig iron there is a big difference in their properties and the way of manufacturing them. Wrought iron has a low carbon content and high tensile strength. Heated to a pliable state it could be cleaned of impurities and formed by being hammered on a forge or by being rolled under great pressure. Due to this process every piece had to be fashioned individually into its desired shape. Cast iron in contrary was rich in carbon and strong in compression. Unlike wrought iron and later on steel it was not subject to rapid oxidation and decay when exposed to atmosphere. Heated into a liquid state it lost its impurities and could be cast in its final form until it was re-melted.¹⁶ This efficient serial process corresponded to the capitalist development coincident to the industrial revolution and may be seen as one of the reasons for its great popularity during this time.



Fig. 1: *The world's first cast-iron bridge in Coalbrookdale*

¹⁴ Ibid., p. 192-194

¹⁵ Ibid., p. 239

¹⁶ New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p. 16-17

2.2 THE APPEARANCE OF CAST-IRON ARCHITECTURE IN AMERICA

America wasn't self sufficient in the iron production until the middle of the 19th century and was dependent on imports.¹⁷ The coke needed for the melting of iron was scarce and only the invention of the hot blast furnace in 1828 allowed the use of anthracite coal instead of coke. Thereafter the production in America started to expand especially in the region of Pennsylvania, which had plenty of anthracite and was close to New York.¹⁸ By the middle of the 19th century iron was sufficiently available and became economical for structural uses.¹⁹

2.2.1 Ferromania

Among the first remarkable architectural applications of cast iron in America were one-storey storefronts, which enabled bigger window openings for the shops on the ground floor by supporting the masonry of the upper floors. The assumed incombustibility of cast iron was a further argument for the application of such fronts because cities like New York were in constant danger of large conflagrations. In 1837 the foundry-owner Jordan L. Mott presented one of the first cast-iron storefronts as a novelty to the American Institute of New York only two years after a fire, which burned 17 blocks in Manhattan. But still, the adoption of cast iron in architecture was slow until the end of the 1840s.²⁰ Only in 1842, Daniel D. Badger, a cast iron pioneer and later on one of the main actors in the cast iron business in New York, built his first cast-iron storefront in Boston.²¹ The engineer and inventor James Bogardus made the next big steps. In 1848 he erected the first multi-storey cast-iron front for the Milhau Pharmacy, which was a self-supporting all-iron construction in front of a conventional brick structure. Two years later he built the Duane Street Factory for himself, which he claimed to be made entirely in cast iron and further to be "the first cast-iron house erected". Although it is still unsure among historians whether this claim of the all-iron construction is true, there is clearer evident, that at least his Harper Building of 1854 was a complete iron frame construction. However, the main achievement of James Bogardus can be seen in the establishment of a construction principle for iron-fronts, which he also patented in 1850. The facades were composed of four basic iron elements, each cast serially in sand-moulds: column, through-beam, spandrel and cornice. This enabled a complete prefabrication and fast erection on site, as the elements merely had to be assembled and bolted together.^{22,23} In cases where the structural frame or skeleton behind was manufactured in iron as well, as for example in the Harper Building, he drew lessons from the research of William Fairbairn and Eaton A. Hodgkinson (see chap. 4.1). The columns were fabricated in cast iron, strong in compression, while the spanning members or girders were manufactured in wrought iron, strong in tension.²⁴ After these few pioneering buildings by James Bogardus around 1850, other pioneers such as Daniel D. Badger joined soon and cast iron started to be used as a common material mainly for stores and commercial buildings throughout America up to the 1880s. Turpin Bannister described this timespan as being in "a state of mind which deserves the name Ferromania" while Sigfried Giedion used the term "cast iron age".^{25,26} Today the largest remaining testimony of this cast iron era can be found in the SoHo Cast Iron Historic District in New York, which is under the protection of the New York Landmarks Preservation Commission since 1973.²⁷ The following chapters will try to comprehend and explain the factors, which led to this euphoric success and wide spread use of cast-iron architecture.

¹⁷ Thorne, Robert: *Structural Iron and Steel, 1850-1900*, Ashgate Variorum, Aldershot, 2000, p. 8

¹⁸ Gloag, John; Bridgwater, Derek: *A History of Cast Iron in Architecture*, Allen & Unwin Ltd, London, 1948, p. 150-162

¹⁹ Bannister, Turpin C.: *Bogardus Revisited*, 1956, in: Thorne, Robert: *Structural Iron and Steel 1850-1900*, p. 12

²⁰ Saint, Andrew: *Architect and engineer - a study in sibling rivalry*, Yale University Press, New Haven and London, 2007, p.173-182

²¹ Gayle, Margot in: *Badger's Illustrated Catalogue of cast-iron architecture by Daniel D. Badger*, Dover Publications, New York, 1981, p. vii

²² Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.70-91

²³ Thorne, Robert: *Structural iron and steel, 1850-1900*, Ashgate Variorum, Aldershot, 2000, p. 8

²⁴ Gayle, Margot in: *Badger's Illustrated Catalogue of cast-iron architecture by Daniel D. Badger*, Dover Publications, New York, 1981, p. vii

²⁵ Bannister, Turpin C.: *Bogardus Revisited*, 1956, in: Thorne, Robert: *Structural Iron and Steel 1850-1900*, p. 12

²⁶ Gloag, John; Bridgwater, Derek: *A History of Cast Iron in Architecture*, Allen & Unwin Ltd, London, 1948, p. 192 & 194

²⁷ New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p. 9

2.2.2 *The role of cast iron foundries in New York*

The expanded production and use of cast iron is a result of the industrialization and the introduction of divided labour. This change also affected the building industry, and the profession of the architect went through a shift in the 19th century. Specialists and engineers emerged, which concerned themselves with specific new materials. Thereby, the technical complexity of building in iron sets it apart from other materials in architecture such as wood, brick and even concrete, which are easy accessible and more or less workable for laymen.²⁸ This led to completely different constellations of project teams, because neither the classical architect, nor the engineer or the traditional builder, had the profound knowledge about the correct application of the material.²⁹ The architect therefore lost its role as a generalist and had to rely on these other participants more frequently. The knowledge of the cast iron foundries was especially in these pioneering times of cast-iron architecture of greatest importance. Accordingly, the foundries were of almost the same importance as the architect in the building process. The architects still designed the basic substructure of a building and defined its general appearance. But their influence in the design of the more detailed cast-iron parts is uncertain. (see chap. 6.3) The characteristic styles of the more prolific architects are recognizable in their cast-iron buildings, while less prominent architects usually were confined to choose stock elements designed by the cast iron foundries themselves or by other architects.³⁰

For this purpose the foundries even employed own architectural departments to design castings and to take care of the clients, as seductive designs presumably helped them to increase their sales. Furthermore, they had an economical interest in the acceptance and popularization of the new material and therefore were keen to advocate it wherever possible. Most of the foundries producing castings for buildings existed already before and just expanded their business into this new field of architectural iron castings. This illustrates a more economical interest in the diversification of the business, rather than an idealistic belief in cast-iron architecture.

The James L. Jackson foundry was established in 1840 and has been the first to cast parts for buildings in New York, which previously mostly had been imported from abroad. Initially they mainly produced smaller parts, such as grates and fenders, and added later on orders of housesmiths heavier parts such as columns, lintels and beams. The housesmiths later on started to add foundries to their business, as did the foundries with smithshops. This consolidation of business units brought the new term "Architectural Iron Works" for this branch. The James L. Jackson Foundry later on also used the popular term for the new branch of business in renaming themselves to the Jackson Architectural Iron Works. Among the most important foundries were Badger's Architectural Iron Works, Cornell's Iron Works, the Excelsior Iron Works and the Aetna Iron Works.³¹ The foundries were geographically located close to each other, what supposedly led to a sharing of knowledge and a certain competition, which accelerated the extended use of cast iron in architecture. Around Centre Street there was even a congestion of foundries in the same blocks.³² Therefore, it is no surprise that the two major publications on the topic of cast-iron architecture in America came from James Bogardus and Daniel D. Badger - two cast iron pioneers located in this area, which were strongly engaged with the foundries. (see chap. 4) Although Bogardus didn't own a foundry himself, he built the first cast iron buildings in New York in co-operation with the James L. Jackson Foundry.

²⁸ Forty, Adrian: *Concrete and culture : a material history*, Reaktion Books, London, 2012

²⁹ Saint, Andrew: *Architect and engineer - a study in sibling rivalry*, Yale University Press, New Haven and London, 2007, p.173-182

³⁰ New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p.12

³¹ Fryer, William J.: *A history of real estate, building and architecture in New York City*, Record and Guide, New York, 1898 AND

New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p.19

³² Bannister, Turpin C.: *Bogardus Revisited*, 1956, in: Thorne, Robert: *Structural Iron and Steel 1850-1900*, p. 53

2.3 EUROPEAN REVOLUTION VERSUS AMERICAN EVOLUTION

In the case of engineering projects such as bridges or rail stations, cast iron was used frequently across both Europe and America, while in traditional architecture such as house building it was used significantly less in Europe. In America, cast iron crept into public favour quite rapidly and was therefore used extensively also for standard purposes, while in Europe the applications were relatively restrained to special occasions where for example large canopies were needed. It can be assumed, that this is to some parts depending on a difference in the mind-set, which also led to a different kind of architecture. The European approach was more revolutionary and sought to find a new form in correlation to the new material, while the cast iron pioneers in America followed an evolutionary approach and redeveloped what was already there. In a first step I will describe the formal differences in the application of cast iron between Europe and America. In a second step I will try to explain this difference by the means of the intellectual discussions held by protagonists of the time.

2.3.1 *The architectural expression of cast iron*

Cast iron revolutionized the structural possibilities of architectural form and lacked historical precedents in terms of ornamentation and associative meaning. On one hand the architects were confronted with the demand for structural "truth" to the material, which originated in the scientific revolution of the 17th century, on the other hand, they were challenged to invest their buildings with historical associations and meanings, which at that time mostly meant ornamentation. These two contradictory impulses challenged the architects of the 19th century to find an adequate application and expression for the new material.³³

In Europe with its long history, the architects refrained from using the new material for the visual expression of their buildings. The first cast-iron structures in the mill buildings in England were mostly hidden behind masonry walls and only visible in interior rooms as beams and columns without decorative aspiration. Later architectural applications of cast-iron structures with a more decorative expression still remained in the interiors as long as it concerned traditional building typologies, such as religious buildings or libraries. The St. George's Church in Everton of 1813 by Thomas Rickman had a gothic inspired and rich decorated structural cast-iron interior with a plain stone exterior. The Halle au Blé in Paris by François Bélanger was built in the same year with a cast-iron dome covering an interior courtyard. This construction was visible from far, but still with a traditional stone cladding towards the street. A popular application of the enclosed cast-iron canopy was the covering of interior courtyards and passages, such as Covent Garden in London of 1828 by Charles Fowler or the Galerie d'Orléans in Paris of 1831 by Pierre-F.-L. Fontaine. Even the famous Bibliothèque Sainte-Geneviève in Paris by Henri Labrousse, built at the same time as James Bogardus' first iron fronts in New York, was still framed by traditional masonry.³⁴ It was rare that European architects trusted in the expression of cast iron as a material for the exterior. Exceptions were new and more functional building typologies such as greenhouses and train sheds. Charles Rohault de Fleury constructed one of the earliest conservatories in the Jardin des Plantes of Paris in 1833. Four years later Joseph Paxton constructed the Great Conservatory at Chatsworth, which used a ridge and furrow roof and was more elaborate and filigree in expression than its French precursor. This development eventually resulted in Joseph Paxton building the most famous European achievement in cast-iron architecture - the Crystal Palace for the Great Exhibition in London in 1851.³⁵

³³ Dobraszczyk, Paul; Sealy, Peter: *Function and Fantasy: Iron Architecture in the Long Nineteenth Century*, Routledge, London, 2016, p.8

³⁴ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.22-34

³⁵ Gloag, John; Bridgwater, Derek: *A History of Cast Iron in Architecture*, Allen & Unwin Ltd, London, 1948, p. 200

The American architects and cast iron pioneers in contrast were less tentative in showing the cast iron on the exterior of their buildings. They started to dissolve the exterior walls into a cast-iron skeleton acting as a closed post-and-lintel system. This alteration from a wall with holes to a frame with fill-ins enabled bigger windows and resulted in a slightly different appearance of the buildings.³⁶ However, this aesthetical change was less radical and innovative than its underlying structure. The cast iron pioneers used castings, which reflected the predominant Victorian taste of the time.³⁷ The historic forms of these revival styles, convenient to the broad public, can be seen as a legitimation for the use of the new material. The buildings were either built with individual castings designed by the architect of the client, or by standard elements available from the cast iron foundries. The first three pioneering buildings with full iron fronts by James Bogardus were simple designs based on the principle of the post-and-lintel construction concept. All of these were finished pragmatically in the same cast iron modules.³⁸ The most notable among them was his own factory at Centre and Duane Street of 1849. (see fig. 2-4) These initial clumsy designs developed rapidly to an elaborate use of Neo-Styles as soon as architects started to be involved in the planning process, as the Sun Building of 1853 by James Bogardus in collaboration with the architect R.G. Hatfield proves.³⁹ (see fig. 5). Throughout the 1850s dominated an Italianate Renaissance Style inspired by the palazzos of Venice, induced by James Bogardus experiences during his time in Italy. (see chap. 4.2) The repetitive Renaissance forms especially matched the serial cast-iron construction principle. (see chap. 2.3.2) The most elaborate example of this area is the E.V. Haugwhout Building of 1856 by Daniel D. Badger, his staff-architect George H. Johnson and the architect J.P. Gaynor. (see fig. 6) By the beginning of the 1860s the combination of classical elements became so free and eclectic that no longer pre-existing stylistic terms can be used. A good example for such a stylistic fabrication is the Condict Brothers Building on 55 White Street of 1861 by Daniel D. Badger and the architect John Kellum in the newly developed sperm candle style. The two-storey columns enabled large openings, which especially fit to cast-iron construction.⁴⁰ (see fig. 7) Another special example is the Grover & Baker Sewing Machine Company Building of 1859 by Daniel D. Badgers staff-architect George H. Johnson in the form of a supersize filigree gothic window.^{41,42} (see fig. 8) This last example was harshly criticized in the Architects' and Mechanics' Journal for its eclectic design.⁴³ (see chap. 5.3) Subsequently to this period, there arose a discussion about the appropriate amount of ornamentation. From this time onwards, there were two tendencies coexisting. On one side, the heavy ornamentation prevailed in the French Second Empire Style, which certainly was the case fore the more representative buildings, such as the Old Gilsey Hotel of 1869 by Stephen D. Hatch.⁴⁴ But on the other side, there was a tendency to reduce the ornamentation from the 1860s onwards, with William J. Fryer as an advocate. Perhaps inspired by the British intellectuals, Fryer was driven by a desire for truthfulness and rejected the imitation of stone by sanding or graining the iron. He stated that "these early stages [of flashy and vulgar appearance] have been passed and taste and utility now go hand in hand". In this respect the A.T. Stewart (later Wanamaker) Department Store of 1862 by John Kellum and the Cornell Iron Works marked the new era for him.⁴⁵ (see fig. 9)

³⁶ Schädlich, Christian: *Das Eisen in der Architektur des 19. Jahrhunderts*, Geymüller Verlag, Aachen, 2015, p. 127

³⁷ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.90

³⁸ Gayle, Margot; Gillon, Edmund V.: *Cast-iron Architecture in New York: a photographic survey*, Dover Publications, New York, 1974, p. viii

³⁹ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p. 96-101

⁴⁰ New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p. 10

⁴¹ Gayle, Margot in: *Badger's Illustrated Catalogue of cast-iron architecture by Daniel D. Badger*, Dover Publications, New York, 1981, p. xv

⁴² Miller, Tom: <http://daytoninmanhattan.blogspot.com/2016/12/the-lost-grover-baker-bldg-no-495.html>, 2016, visited 15.08.2018

⁴³ *Stone versus Iron*, in: *The Architect's and Mechanics' Journal*, November 1859, p. 28-29

⁴⁴ Gayle, Margot; Gillon, Edmund V.: *Cast-iron Architecture in New York: a photographic survey*, Dover Publications, New York, 1974, p. ix

⁴⁵ Fryer, William J. in: *The Architectural review and American builders' journal*, Vol. 1, Claxton; Remsen & Haffelfinger, Philadelphia, 1869, p. 621

What remains is the question, whether this tendency to reduction really became prevalent out of an aesthetical and moralistic search for truthfulness, or if this rationalisation rather was an early architectural bending for capitalism out of economical opportunism. Although in Fryers case the critique came from an architect, it seems conceivable that economic considerations played a role, as the main drivers in cast-iron architecture still were foundry owners with business interests. The historian Walther Knight Sturges likewise speculated that the intense use of ornamentation rendered unnecessary as soon as the public was successfully convinced of the new unconventional material by the initial use of familiar ornamented forms.⁴⁶

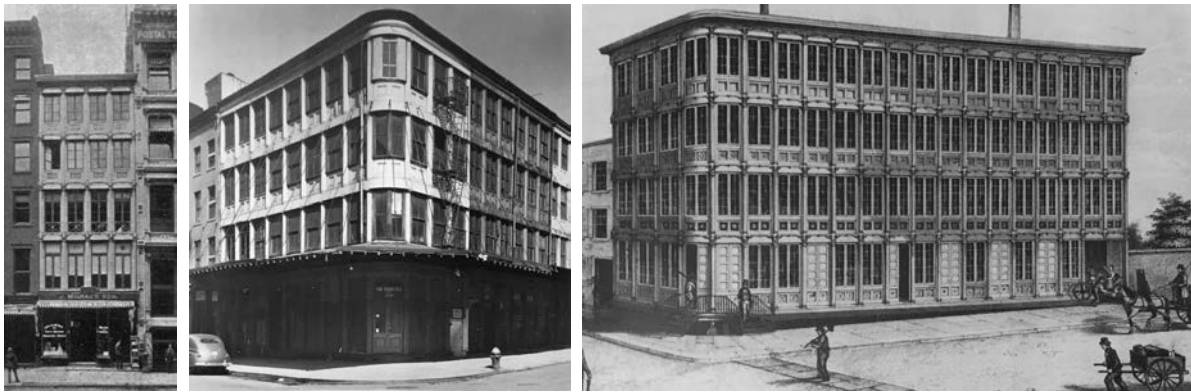


Fig. 2-4: James Bogardus' first three cast-iron buildings:
John Milhau's Pharmacy (l.), Edgar H. Laing Stores (m.), James Bogardus' own all iron factory (r.)



Fig. 5-6: The Italianate Renaissance Style - The Sun Iron Building (l.) & The E.V. Haughwout Building (r.)

⁴⁶ Sturges, W. Knight: *Cast in Iron: New York's structural heritage*, in: *The Architectural Review*, October 1953

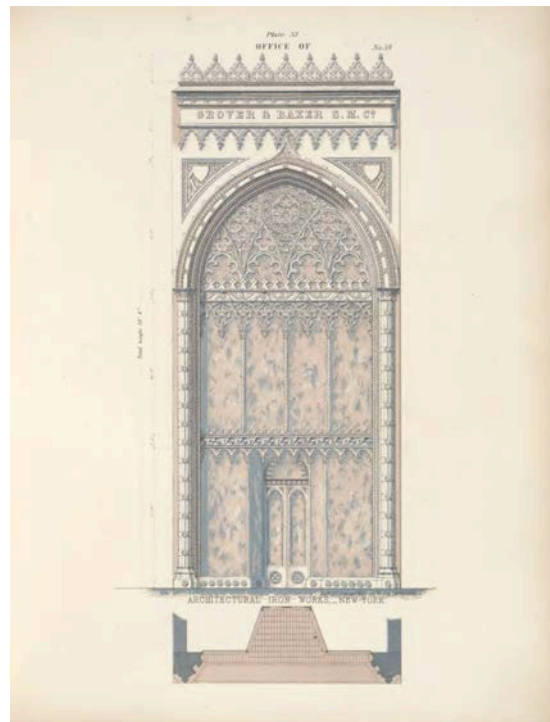
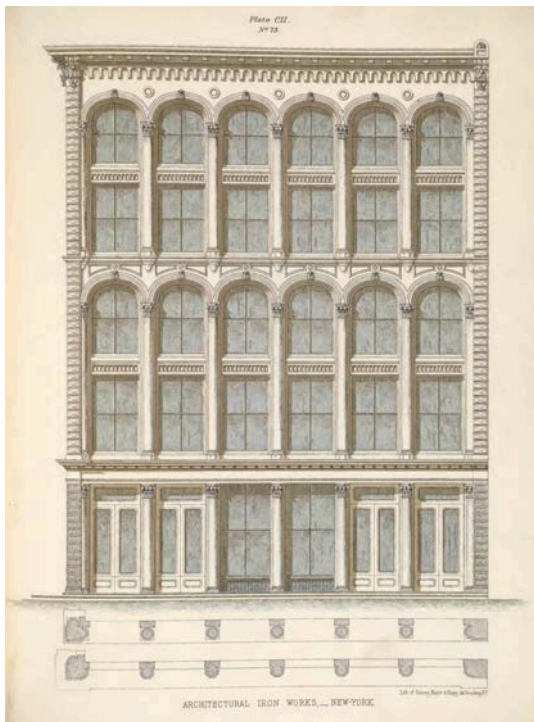


Fig. 7-8: The loss of pre-existing stylistic terms - The sperm candle style (l.) & Gothic inspired eclecticism (r.)



Fig. 9: The tendency to reduction - A.T. Stewart (later Wanamaker) Department Store

2.3.2 *The intellectual debate on cast iron in architecture*

The emergence of cast iron as a new material in architecture was accompanied by a discussion on its appropriate structural and aesthetic application. However, the difference in the topics discussed was significant between the "old world" of Europe and the "new world" of America. Because of my origin I start with the European view, which is more common to me and try to relate it to the American view afterwards.

The transfer of an aesthetically traditional stone construction to cast iron, as it happened in America, was in Europe very controversial at that time. The English theoretician John Ruskin published in 1851 „The stones of Venice“, where he promoted a city made of stone and visually reminiscent of Venice.⁴⁷ At least the postulation of the visual reminiscence seems to be fulfilled in America's cast iron architecture, as the cast-iron fronts stood shoulder to shoulder along the streets just as the Venetian palazzos stand along the canals of Venice.⁴⁸ Still, it is directly opposite John Ruskin's idea of architecture as stated in his second major Publication "The Seven Lamps of Architecture" in 1849. There, Ruskin criticized the imitation of stone constructions by use of cast iron for moral reasons. According to him, iron should not be used as a load bearing structural material in forms of columns and lintels. He argued that construction always evolved from materials around the humans on the surface of the earth such as stone, clay and wood.⁴⁹ William Vose Pickett was another English theoretician of the time, who was especially concerned with the application of metals and iron in buildings. In 1845 he published "A New System of Architecture" and in 1849 "New Forms in Architecture for Iron". He believed that iron architecture was able to combine utility and beauty. His position was therefore more open to the application of the new material compared to John Ruskin. Yet he agreed with him, that the application of a new material consequently has to happen in a new form, rather than copying old constructive method. He advocated a form based on natural curves instead of the straight line. Furthermore, it should fulfil certain demands for constructive truth. The single parts should stay recognizable, and the construction shouldn't appear solid when it was hollow.⁵⁰

It is obvious that these European theoreticians had only little impact on the work of the practicing cast iron pioneers in New York, although the latter were aware of at least Pickett's publications as the introduction to Daniel D. Badger's catalogue in 1865 proves. Badger used Pickett's statements on the abilities of cast iron for building purposes to strengthen his own argumentation, but rejected his formal ideas at the same time. He stated: "his [Pickett's] ideas would be deemed crude at the present time" and added: "Mr. Pickett's work was purely theoretical" in contrary to his own practical work.⁵¹ These statements by Daniel D. Badger show a more progressive and pragmatic attitude, in contrast to the moral discussions in Europe. William J. Fryer, another American advocate for cast-iron architecture, explained in 1869 that it was easier for Americans to accept the new building material because prejudices would be less settled than in older countries, such as England. He also argued that, "if the ancient examples of cornices and capitals [...] are deemed best for stone, then they are be best for iron also".⁵² Interestingly the report of the New York Landmarks Preservation Commission goes even further and states that at that time in New York, works in iron were only considered to be "Architecture", if they imitated forms that had been evolved for stone buildings. There was even a special light stone-tinted paint called "drab", which was used for cast-iron buildings to create rich patterns of transparent shadows.

⁴⁷ Ruskin, John: *The stones of Venice*, George Allen, Orpington-London, New Edition in small form, 1898

⁴⁸ Gayle, Margot; Gillon, Edmund V.: *Cast-iron Architecture in New York: a photographic survey*, Dover Publications, New York, 1974, p. ix

⁴⁹ Ruskin, John: *The Seven Lamps of Architecture*, George Allen, Sunnyside-Orpington-Kent, Sixth Edition, 1889

⁵⁰ New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p.24

⁵¹ Badger, Daniel D.: *Illustrations of Iron Architecture Made by the Architectural Iron Works of the City of New York*, Baker & Godwin, NY, 1865, p.4

⁵² Fryer, William J. in: *The Architectural review and American builders' journal*, Vol. 1, Claxton; Remsen & Haffelfinger, Philadelphia, 1869, p.743

The report concludes that their aim wasn't to develop a new system of architectural design, but merely to prove that anything that could be done in stone could be done just as well and more cheaply in iron.⁵³ Margot Gayle points out, that the growing popularity of cast iron fronts in the 1850s also reflected Victorian taste, which could easily be reproduced in cast iron and enabled rich ornamentation at moderate cost.⁵⁴ Therefore, the ability of ornamentation was amongst the most important aesthetic arguments towards the use of cast iron in America. As Banister Turpin already pointed out more polemically, it enabled the use of the richest aristocratic styles within the limited budgets of the bourgeoisie, which was growing at that time. Therefore, it would have joined the characteristic substitute materials, which were symbolic for the 19th century search for low-cost "haute couture", such as stucco, terra cotta or papier maché.⁵⁵

I would suggest a slightly more positive and less opportunistic reading of these formal imitations of stone constructions. The use of forms convenient to the public can be seen as an explanation for the success in establishing cast iron, and with it several functional modernizations, in architecture. It enabled to continue the city streetscape in a harmonious form, while introducing modern improvements to the old brick facades, such as the bigger window openings. (see fig. 10-11) It is the moment of construction history where the building facade changes from a wall with holes to a skeleton with fill-ins.⁵⁶ Christian Schädlich even indicates that the renaissance principle of columns and entablature especially suits to the skeleton construction.⁵⁷ Therefore, it could be considered as the main achievement of the cast iron pioneers to have married the contemporary Victorian taste with a modern desire for light.



Fig. 10-11: A contemporary stone facade in the Greek Revival Style (l.) in comparison to a cast-iron facade by Daniel D. Badger's Architectural Iron Works (r.). The difference in the opening ratio is significant.

⁵³ New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p.11/24

⁵⁴ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.90

⁵⁵ Bannister, Turpin C.: *Bogardus Revisited*, 1956, in: Thorne, Robert: *Structural Iron and Steel 1850-1900*, p. 53

⁵⁶ Thirty years after the first cast-iron fronts, in 1879, the principle of the iron-skeleton eventually led to the modern concrete slab and pillar system as François Hennebique used concrete to improve the fire resistance of an iron skeleton and thereby developed the "Hennebique system". See: Brühwiler, Eugen: *Das System Hennebique*, in: *Tec21 "Tragende Werte"*, vol.48, 2013.

⁵⁷ Schädlich, Christian: *Das Eisen in der Architektur des 19. Jahrhunderts*, Geymüller Verlag, Aachen, 2015, p. 127

2.4 THE ECONOMICAL BEAUTY

Because the use of iron can be seen as a result of the industrialization, it is necessary to relate its establishment to the economical processes of early capitalism, which probably have been even more formative to the processes than the individual actors were. So, especially during this time of rapid growth in America, the more economically efficient a method or technique was, the sooner it prevailed. Besides all the technical advantages and the efforts of persuasion by the cast iron pioneers, one should not forget, that one of the most convincing aspects for the clients was the availability of rich and beautiful ornamentations at moderate prices, at a time when the growing Bourgeoisie had a desire for the representation of its newly accumulated fortune. The economic advantages, therefore, were one of the most factual convincing aspects in the establishment of cast-iron architecture. Not only for the customers purchasing the cast-iron structures, but also for the producers of cast-iron architecture these were a reason to start working in this area at all

2.4.1 *Economical advantages for the producers*

The idea of capitalism is strongly connected to the idea of growth and continually generates a surplus, which needs to be reinvested. Thus there is constantly a desire to acquire and exploit new markets. On his travel through Italy, James Bogardus already envisioned cast-iron architecture becoming "the means of greatly adding to our national wealth and establishing a new, a valuable, and a permanent branch of industry".⁵⁸ As soon as he had successfully completed his first buildings his vision already became true and many founders followed his example as active competitors.⁵⁹ Therefore, the protagonists in cast-iron architecture mostly haven't been selfless inventors but were first of all businessmen. (see chap. 2.2.2) Cast iron was especially apt to commercial exploitation as it allowed the erection of a building in a shorter time by the means of serial prefabrication, compared to traditional building techniques. Thus the businessmen were able to produce more buildings in the same timespan and therefore earned more money. A further advantage was that the same casting patterns could be used for different buildings, although the client presumably had to pay for the design in each case separately. James Bogardus already used the same patterns for his first three buildings, the John Milhau Pharmacy of 1848, the Edgar H. Laing Store of 1849 and his own factory at Centre and Duane Street of 1850. The historian Bannister Turpin even suggests that he could have delayed the work on his own building to produce the moulds at his clients cost.⁶⁰ Daniel D. Badger's catalogue also shows multiple applications of patterns. The casting pattern of the E.V. Haughwout Building of 1856 and the Halsey Building in Brooklyn of 1857 appear to be similar to each other. Even more interestingly, Badger used a pattern for his own office building of 1851, which he later also applied for the Cary Building of 1856.⁶¹

⁵⁸ Bogardus, James: *Cast iron buildings: their construction and advantages*, J.W. Harrison Printer, New York, 1856, p.4

⁵⁹ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.89

⁶⁰ Bannister, Turpin C.: *Bogardus Revisited*, 1956, in: Thorne, Robert: *Structural Iron and Steel 1850-1900*, p. 49

⁶¹ Badger, Daniel D.: *Illustrations of Iron Architecture Made by the Architectural Iron Works of the City of New York*, Baker & Godwin, NY, 1865

2.4.2 *Economical advantages for the customers*

Already in 1851, William D. Wallach stated: "love of change had little to do in producing the demand for iron houses". Instead he mentions several economical advantages, such as saving of valuable floor space, lower cost of insurance due to the fireproof material, a longer lifespan and the easy ornamentation as the main aspects, which "recommended them to capitalists here".⁶² However, cast iron wasn't really inexpensive as a material itself. A newspaper article of 1851 reported that cast iron in York New was double the price per ton as in England, namely 26£ per ton, equalling roughly 4'497\$ today.^{63,64} Although the prices declined, because of the growing iron industry in America, the cost of a building in iron still was similar to one in stone in the 1870s and 1880s.⁶⁵ According to William J. Fryer stone was expensive as well, because it was scarce and modern machinery for planing and shaping had not yet been introduced to reduce the cost of manual labour.^{66,67} The price of stone accordingly rose with the complexity of the work piece desired due to the time intensity of the handcraft. Therefore, serially cast iron had a major economical advantage in a time where Victorian taste dominated, for a more elaborately ornamented iron building was available at the same price as a conventional building. Although the cast-iron buildings were not cheap as such, they seem to have been worth it in the long run, as there was awareness on the long-term value of a durable construction. The successful businessman Alexander Turney Stewart had several cast-iron structures built and is reported to have been "without any desire to save in the first cost of the building".⁶⁸ The advantage of the long-lasting material, which only has to be repainted from time to time, was also proclaimed by Daniel D. Badger in his 1865 catalogue and seems to match up with reality considering the conditions of the well kept and still standing buildings today.⁶⁹ Last but not least, the clients, often owners of stores, surely also profited of the soft value of having a more representational building, as for example the famous E.V. Haughwout Building renovated in 1995 and still standing today.

⁶² Wallach, William D.: *Editors Correspondence*, New York, 07.06.1851, in: *Weekly National Intelligencer*, Washington D.C., Sat. 14.06.1851, p.7

⁶³ *Iron House-Building in New York*, in: *The Illustrated London News*, No.478 - Vol. XVIII, Saturday 12.04.1851, p.1-2

⁶⁴ CPI Inflation Calculator: <https://www.officialdata.org/1851-GBP-in-2018?amount=26>, visited 18.08.2018

⁶⁵ New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p.12

⁶⁶ Fryer, William J.: *A history of real estate, building and architecture in New York City*, Record and Guide, New York, 1898, p.457

⁶⁷ Fryer, William J. in: *The Architectural review and American builders' journal*, Vol. 1, Claxton; Remsen & Haffelfinger, Philadelphia, 1869, p.743

⁶⁸ Fryer, William J.: *A history of real estate, building and architecture in New York City*, Record and Guide, New York, 1898, p.459

⁶⁹ Badger, Daniel D.: *Illustrations of Iron Architecture Made by the Architectural Iron Works of the City of New York*, Baker & Godwin, NY, 1865, p.5

2.5 THE LEGACY OF CAST-IRON ARCHITECTURE IN AMERICA

In the pioneering times of cast-iron architecture, previous to the foundation of the New York Department of Buildings in 1860, there existed only few building regulations controlled by local fire wardens. These were almost exclusively directed to the prevention of frame or wooden structures in downtown areas.⁷⁰ But times changed and at least since the building law amendments of 1871 it also included regulations related to iron construction.⁷¹ By then cast-iron architecture became common and reached its height of popularity in New York towards the end of the decade.⁷² The 1876 publication "Architectural Iron Work - a practical work for iron workers" by William J. Fryer indicates an active professionalized business, where knowledge is shared and an increase in efficiency constantly searched.⁷³ (see chap. 4.4) But the same search for new and more efficient solutions, which initially led to the architectural application of cast iron, eventually resulted in its sudden abandonment only 30 years later. The main reason for this was the desire to build higher than the conventional five to six stories known before. Interestingly the cast iron pioneer James Bogardus already envisioned the skeleton construction of the later high-rise buildings in two shot towers built in 1855 and 1856. These towers were constructed from load-bearing cast-iron frames with brick in-fills and are supposed to have inspired the pioneers of the first skyscrapers in Chicago.⁷⁴ However, only technical innovations such as the elevator and the steel frame made this dream really become true.⁷⁵ Sir Henry Bessemer invented the "Bessemer process" for the production of steel - an alloy of carbon and iron, which is harder and stronger than wrought iron - already in 1856. But it wasn't before the 1870s that it was economical available in large quantities and used in building more extensively.⁷⁶ Besides the bigger strength of steel, there also arose some questions on the supposed incombustibility of cast iron because fire protection became more important with greater building heights. Terra cotta cladding offered a new possibility of protecting the steel construction and served at the same time as inexpensive replacement for the popular cast-iron ornamentation.⁷⁷ The smaller amount of building regulations in Chicago compared to New York resulted in a relocation of the centre of innovation. George H. Johnson, the staff architect of Daniel D. Badger, also moved to Chicago and was involved in the application of fireproof hollow-tile flat-arches in the Kendall building in 1872, which was another important novelty on the way to the skyscraper.⁷⁸ This could be seen as an example for the undogmatic visionary thinking of the American cast iron pioneers, as George H. Johnson left cast iron in search of the newest innovations. Although the steel-frame of the skyscrapers evolved out of the cast-iron frames and acted as a vivid legacy to it, another key innovation was lost for almost half a century with the fall of the cast-iron architecture in the 1870s. Namely the idea of the curtain-wall, which was inherent to the cast-iron fronts as they had a uniform appearance with little relation to the load-bearing structure behind and were constructed from prefabricated parts. The cast iron age therefore could be seen as an early precursor to the rational modernism of the 20th century.⁷⁹

⁷⁰ Fryer, William J.: *A history of real estate, building and architecture in New York City*, Record and Guide, NY, 1898, p.287-290

⁷¹ Fryer, William J.: *Architectural Iron Work: A practical Work for Iron Workers, Architects, and Engineers*, John Wiley & Sons, NY, 1876, p.154-168

⁷² New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p.10

⁷³ Fryer, William J.: *Architectural Iron Work: A practical Work for Iron Workers, Architects, and Engineers*, John Wiley & Sons, NY, 1876

⁷⁴ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.169-173

⁷⁵ Fryer, William J.: *A history of real estate, building and architecture in New York City*, Record and Guide, NY, 1898, p.463

⁷⁶ Gloag, John; Bridgwater, Derek: *A History of Cast Iron in Architecture*, Allen & Unwin Ltd, London, 1948, p.159

⁷⁷ New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p.14

⁷⁸ Fryer, William J.: *A history of real estate, building and architecture in New York City*, Record and Guide, NY, 1898, p.476

⁷⁹ New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p.18-23

3. THE NEED FOR LEGITIMATION

This Chapter tries to give an overview of the quarrels, which accompanied the introduction of cast iron as a new building material in America, considering the side of critique as well as the side of the advocates of cast iron.

3.1 INITIAL RESISTANCE TO CAST IRON

If there is a change or something new emerging, critique and scepticism are mostly nearby. Although there are not many traceable sources of critique in the newspapers and periodicals of the time, the strong reactions of the protagonists in their argumentation suggests, that they were confronted with harsh critiques as well from a professional side, as also from the side of potential customers. Cast iron Pioneer Daniel D. Badger for example reported that in 1842 he only was allowed to erect his first cast-iron structure in Boston, which rather was a ground floor storefront than a complete facade, after he guaranteed to the client that he would remove it on his own expense if it would fail.⁸⁰ James Bogardus, another cast iron pioneer, states in the introduction to his major publication: "the opinion of most men of scientific reputation, was [in 1848] unfavourable to its use for this purpose; and, amongst all classes, there was also a very strong and general prejudice against it". He mainly explained this resistance by reports on accidents that happened mostly in England, due to the wrong use of the material.⁸¹ A report in the New York Herald in 1851, gives testimony of the presence of accidents in England in the popular press. The article headlined: "A warning for Engineers; the cause of danger in massive iron shafts". It then reported in dramatic manner the snapping of a cast-iron shaft and even generalized that it proved "the danger and insecurity of any large body of wrought or cast iron." It further explained the collapse scientifically by brittleness of the material due to irregularities in the cooling process and concluded by a remark that "Nature, also, must be consulted and attended to [in the application of new materials]".⁸²

The article also shows the problem, stated by cast iron proponent William J. Fryer in 1869, namely that it is difficult in the minds to separate wrought and cast iron. Especially if it comes to the resistance against weather there is an important difference because cast iron oxidizes much slower than wrought iron.⁸³ A newspaper report in 1854, which speaks in favour of cast iron, presents the voice of a "scientific gentleman" and critic who refers to problems of expansion and contraction of the bronze-cladding at the monument "Colon de la Place Vendome" in Paris, claiming that the same problems would appear in cast iron.⁸⁴ Obviously this shows another confusion in material properties, thus the reaction to changes in temperature is of a significant difference between cast iron and bronze. William J. Fryer then also states in 1898 that: "The greatest bugbear that had to be overcome was the assertion as to the expansion and contraction of the metal"⁸⁵ Besides this there were initially several other not completely accurate beliefs in the material properties, such as that it would attract lightnings, melt in fire or even collapse under its own weight.⁸⁶

⁸⁰ Badger, Daniel D.: *Illustrations of Iron Architecture Made by the Architectural Iron Works of the City of New York*, Baker & Godwin, NY, 1865, p. 3

⁸¹ Bogardus, James: *Cast iron buildings: their construction and advantages*, J.W. Harrison Printer, New York, 1856, p.3

⁸² European News: *A warning for Engineers; the Cause of Danger in Massive Iron Shafts*, in: *The New York Herald*, 10.06.1851, Morning Edition, p.1

⁸³ Fryer, William J. in: *The Architectural review and American builders' journal*, Vol. 1, Claxton; Remsen & Haffelfinger, Philadelphia, 1869, p.743

⁸⁴ *Colwell's Iron Building - Revolution in Architecture*, in: *Weekly National Intelligencer*, Washington DC, Saturday 09.09.1854, p.8

⁸⁵ Fryer, William J.: *A history of real estate, building and architecture in New York City*, Record and Guide, New York, 1898, p.458

⁸⁶ Bogardus, James: *Cast iron buildings: their construction and advantages*, J.W. Harrison Printer, New York, 1856, p.4

These initial restraints started to lose their power in 1851 with the completion of the Crystal Palace built for the Great Exhibition in London. The news of this spectacular cast-iron structure designed by Joseph Paxton was widely received and depicted in American newspapers.⁸⁷ What was initially perceived with scepticism now even seemed desirable and led to a "state of mind" which Turpin Bannister had called "Ferromania". Only three years later, in 1854, New York received its own cast-iron Crystal Palace.⁸⁸

The New York Crystal Palace already burnt to the ground without any loss of life in 1858, as depicted in dramatic pictures in the newspapers.⁸⁹ (see fig. 12-13) Afterwards, the critical discussion around the fire resistance of cast iron started to reappear, as an article in the *New York Herald* with the title "The burning of the Crystal Palace - No Safety in Iron" and an objecting reply by Daniel D. Badger in the same newspaper only four days later prove.^{90,91} The discussion never ended completely, as there seems to be no clear answer to the cause. From a present-day perspective, cast iron can be seen as fire resistant compared to other available building materials of the time such as wood, but from a scientific point of view it buckles at relatively low temperatures and has the disadvantage of cracking when exposed to a shock of cold water during the process of putting out a fire.⁹²

In general, the critique towards cast iron was less strong in America compared to England, because there were built examples from England, such as the Crystal Palace, which demonstrated the stability of the material. American contemporaries also tried to argue, that this was due to a less dogmatic and more progressive American attitude in comparison to the one of Europe. William J. Fryer stated in 1869: "In this country, where stone and brick are scarce and expensive, and where prejudices are less settled than in older countries, cast iron building fronts have crept into public favour and confidence more rapidly than elsewhere."⁹³ Another article on cast iron stressed the argument that the American mission was "the settlement and development". Further explaining that Architecture would be the "last remnant of old fogyism in our [America's] industrial pursuits" and, therefore, saving time in building by the means of cast iron would be the most important argument.⁹⁴ With progress as a main concern, there was also a different discussion around the aesthetics and moral standards of cast-iron architecture in America than in Europe. (see chap. 2.3.2) Or as William D. Wallach stated in 1851: "Our [Americas] superiority is in the construction of conveniences and accommodations for a nation of busy equal freemen; theirs [Europe] in the elaboration of works akin to the fine arts, to beguile the idle hours of the wealthy or titled few."⁹⁵

⁸⁷ Depiction per example in: *The Crystal Palace*, in: *Gleason's Pictorial*, F. Gleason, Boston, Vol. 1 - No. 14, Saturday 04.10.1851, p.5, in: *Gleason's Pictorial Drawing-Room Companion*, vol.1, F. Gleason, Boston, p.213

⁸⁸ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.114/115

⁸⁹ Depiction per example in: *The Destruction of the Crystal Palace*, in: *Harper's weekly*, 16.10.1858, in: *Harper's weekly*, Vol. 2, Harper & Brothers Publishers, New York, 1858, p.660-661

⁹⁰ *The Burning of the Crystal Palace - No Safety in Iron*, in: *The New York Herald*, Thursday 07.10.1858, p.4

⁹¹ Badger, Daniel D. in: *The New York Herald*, Morning edition, Monday 11.10.1858, p.1

⁹² New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p.21

⁹³ Fryer, William J. in: *The Architectural review and American builders' journal*, Vol. 1, Claxton; Remsen & Haffelfinger, Philadelphia, 1869, p.743

⁹⁴ *Colwell's Iron Building - Revolution in Architecture*, in: *Weekly National Intelligencer*, Washington DC, Saturday 09.09.1854, p.8

⁹⁵ Wallach, William D.: *Editors Correspondence*, New York, 07.06.1851, in: *Weekly National Intelligencer*, Washington D.C., Saturday 14.06.1851, p. 7

3.2 WAYS OF RESPONSE TO CRITICISM

The pioneers of cast-iron architecture, mostly foundry owners in collaboration with innovative architects, which were confronted with this scepticism knew that it wasn't sufficient to trust solely in the material qualities and the visual appeal of their built architecture if they wanted to be economically successful in their business. Besides their innovative use of material they were keen to use state of the art media in order to communicate their progress and to popularize cast-iron. Depending on the audience they wanted to address, they used different channels of communication. Publications by the pioneers themselves using contemporary print techniques were used as a kind of portfolio to persuade potential clients and also as a form of manifesto which should popularize the material and motivate other professionals to use the material as well. The growing "penny press" served as a way to enter into the critical discussions and to reach the broad public including a wide range of potential clients, while builders' magazines could be used to convince other professionals in specialized discourses of the application of the new material. Although most of the pioneers were businessmen, it seems that they believed in cast iron and wanted to popularize it, by sharing their knowledge instead of monopolizing it. (see chap. 6.2) The success of such efforts at persuasion of course depended on the credibility of the proponent. They always tried to leave the public debates as winners and never got tired to mention what they already achieved, because there is no better proof than a realized building and a happy client. Besides this, they also used patents as a marketing tool and guarantee for their technical knowledge about the application of the material. The following chapters are going to analyse these forms of popularization by the protagonists in detail and will always relate their published self-conception to the historical context of the time to get a better understanding of the active processes.



Fig. 12-13: Engravings of the burning of the New York Crystal Palace

4. PUBLICATIONS BY CAST IRON PIONEERS

Publications are a way to have the complete control over a story, and therefore especially useful for the advocates of cast iron to establish their own narrative, postulating their own view without enabling the critics to contradict their argumentation directly. This chapter will analyse the two major publications by New York cast iron pioneers and relate them to the historical context. By this it will be shown how the published self-conception of the authors corresponds with the factual development and technical realities of the time. The earlier of these two publications is "Cast-iron houses: their constructions and advantages" by James Bogardus in 1856. The second major publication is "Illustrations of Iron Architecture Made by the Architectural Iron Works of the City of New York" by Daniel D. Badger issued in 1865. These two publications were a mixture of pure advertisement and a general justification of cast iron as a material for architecture presenting a wide range of arguments to convince the wide mass of the use of cast iron. There were certainly also publications by other foundries, which cannot be considered more closely in this work. Mostly, they were merely advertisement pamphlets and less radical postulations to the use of cast iron and therefore also of a smaller impact.⁹⁶

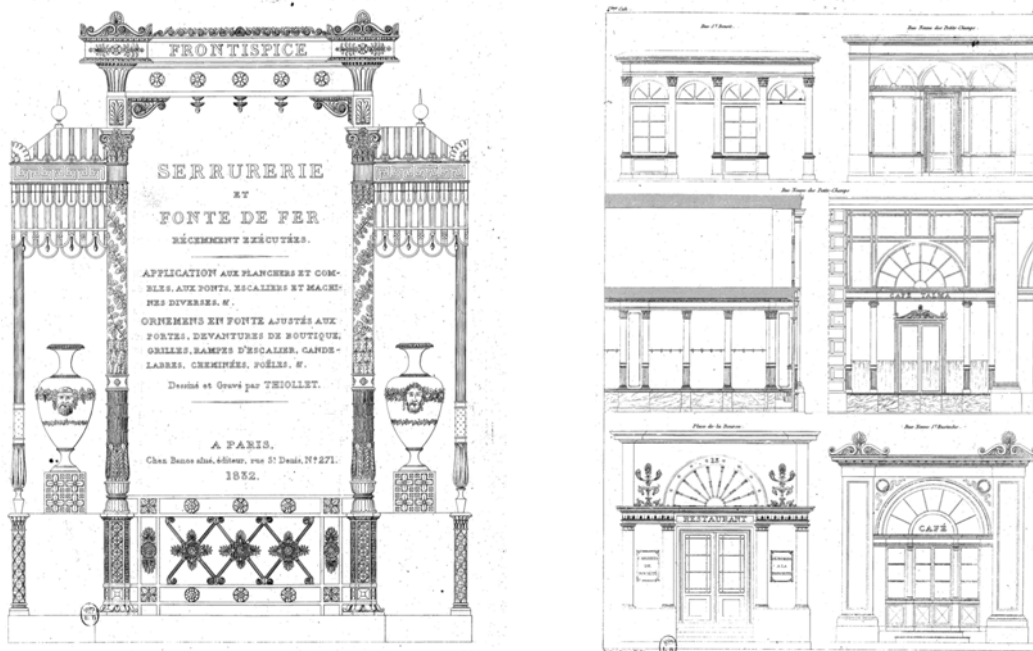


Fig. 14: Pages of "Serrurerie et fonte de fer récemment exécutées" by François Thiollet

⁹⁶ For example there were small pamphlets by the Eagle Iron Works from Buffalo and the Chase Brothers Company from Boston as well as Pocket Catalogues from Bartlett & Robbins in Baltimore, Dunn & Witt as also the Bouton's Iron Works from Chicago. J.B. Wickersham even published a Hardcover Catalogue called "A new phase in the Iron Manufacture". See also: Gayle, Margot in: *Badger's Illustrated Catalogue of cast-iron architecture* by Daniel D. Badger, Dover Publications, New York, 1981, p. ix

4.1 EUROPEAN PREDECESSORS

In Europe, there have been previous publications on the topic of cast iron in architecture, mostly by engineers and architects. It is to assume that the Americans knew of these publications and got inspired by them. Though their effect was mostly directed towards a professional audience, while the later American publications combined the advocating of cast iron with advertisement, accessible to a more popular audience.

An early European publication was "Serrurerie et fonte de fer récemment exécutées" published in 1832 by the French architect François Thiollet in Paris. As the title already explains, it is a collection of architectural locksmith- and cast-iron-works recently executed. The collection of plates depicts ground-floor storefronts in cast iron and other architectural elements.⁹⁷ (see fig. 14) Bannister Turpin assumes that it could have influenced the first cast-iron fronts in America, such as the one from Alexander Jackson Davis for the Lyceum of Natural History in 1835.⁹⁸ Interestingly, François Thiollet opened his introduction with almost the same sentence as Daniel D. Badger concluded the introduction of his publication in 1865, by stating that the aim of the publication was to propagate the good taste. He further explained that his publication was directed specifically to other artists while Badger's aimed at a less defined and wider audience.⁹⁹

William Vose Pickett was an English architectural theoretician who focused on finding a new and adequate form of architecture induced by the introduction of iron as a new building material. He published two books on this matter which both contained solely text without any images.¹⁰⁰ It is assumed that his visionary architectural ideas didn't have a big influence on the architects of his time because he "was unable to fix his designs with seductive images".¹⁰¹ This distinguished his publication clearly from the later aesthetically seductive American publications, which owned part of their impact to this aspect. Although these books were published in London, it is clear, that at least Daniel D. Badger was aware of the publications by William Vose Pickett, because he mentioned him in the introduction to his own publication in 1865.¹⁰² (see chap. 4.3)

William Fairbairn and Eaton A. Hodgkinson were English engineers concerned with investigation on the material properties of iron from the 1830s to the 1850s. In 1854 Fairbairn published "On the Application of Cast and Wrought Iron to Building Purposes" in London which was a standard reference for the use of iron in architecture at that time. It is possible that James Bogardus learnt from their publications the use of wrought iron for beams, especially the I-Beam, under tensile strength and cast iron for columns under compressive pressure.¹⁰³ In his 1856 publication "Cast Iron Buildings: their construction and advantages" Bogardus used a sectional drawing similar to a depiction of Fairbairn showing the connection of column and beam.¹⁰⁴ (see fig. 16)

⁹⁷ Thiollet, François: *Serrurerie et fonte de fer récemment exécutées*, Chez Bance aîné éditeur, Paris, 1832

⁹⁸ Bannister, Turpin C.: *Bogardus Revisited*, 1956, in: Thorne, Robert: *Structural Iron and Steel 1850-1900*, p.52

⁹⁹ Thiollet, François: *Serrurerie et fonte de fer récemment exécutées*, Chez Bance aîné éditeur, Paris, 1832, p.1 AND

Badger, Daniel D.: *Illustrations of Iron Architecture Made by the Architectural Iron Works of the City of New York*, Baker & Godwin, NY, 1865, p.9

¹⁰⁰ Pickett, William Vose: *New System of Architecture, founded on the forms of nature*, Longman & Co., London, 1845, AND

Pickett, William Vose: *New Forms in Architecture for Iron*, John Ollivier, London, 1849

¹⁰¹ Guedes, Pedro: *William Vose Pickett's celebration of an imagined architecture - The failure of invention without representation*, Society of Architectural Historians Australia and New Zealand, Napier, New Zealand, 2005, p.1

¹⁰² Badger, Daniel D.: *Illustrations of Iron Architecture Made by the Architectural Iron Works of the City of New York*, Baker & Godwin, NY, 1865, p.4

¹⁰³ New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p.17

¹⁰⁴ Fairbairn, William: *On the Application of Cast and Wrought Iron to Building Purposes*, 2nd Ed., John Weale, London, 1857-58 (1st Ed., 1854)

4.2 JAMES BOGARDUS' "CAST IRON BUILDINGS"

4.2.1 *On the author*

James Bogardus started as a watchmaker and engraver in Catskill, New York. Around the 1830s he moved to New York and became an inventor with a total amount of thirteen US Patents and one British Patent until 1850. For his inventions, such as a three-wheeled clock, a gas meter and an improved version of an "eccentric mill", he was awarded several times by the American Institute, which was founded in 1828 and connected the progressive men of New York. In 1836 James Bogardus travelled to Europe and lived in London until 1840. Supposedly inspired by the cast-iron constructions of England and the Renaissance architecture seen on a travel through Italy, he conceived his idea for the construction of historicist cast-iron buildings.¹⁰⁵ In 1848 he was able to realize his first multi-storey cast-iron front for John Milhau and only two years later he finished his own all-iron factory building at Centre and Duane Street, using the principle he got patented in 1850. (see chap. 2.3.1 + 6.1) He can be seen as an important pioneer in cast-iron architecture, because he was able to put together what was already there in parts.¹⁰⁶ Although he had the patent on the construction principle and was involved in the erection of many cast-iron buildings, he didn't own an iron foundry himself. Probably more out of belief in his invention, rather than of financial interests, he became an active apostle for the use of cast iron in architecture.

4.2.2 *The circumstances of the publication*

"Cast Iron Buildings: Their Construction and Advantages" was first issued in 1856 and a second time in 1858 in a slightly extended version. It was a simple print on plain white paper in the size of about 13 by 20 cm, which contained a small essay of sixteen pages and six additional illustrations. The book can be seen as a joint work of James Bogardus and John W. Thompson, his long-time colleague, business partner and secretary, versatile in writing. Although the essay by Thompson was written in the third person, referring to "Mr. Bogardus", it can be taken as reflecting on James Bogardus' own ideas.¹⁰⁷ The introductory phrases of the essay stated that the aim of the pamphlet was "to furnish correct information" on cast-iron architecture, because "so much that is erroneous" would have been said.¹⁰⁸ Besides this educational aspiration, underlined by the extended technical explanations throughout the essay, it also revealed a desire to establish a personal narrative on the "correct" use of the new material. Accordingly, this likewise served to promote his business, especially as the publication seemed to be addressed to builders, architects and potential clients new to the topic, rather than to other professionals that were already taking part in the debates.¹⁰⁹

¹⁰⁵ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.38-69

¹⁰⁶ *Ibid.*, p.70-88

¹⁰⁷ *Ibid.*, p.161-162 & 174-175

¹⁰⁸ Bogardus, James: *Cast iron buildings: their construction and advantages*, J.W. Harrison Printer, New York, 1856, p.3

¹⁰⁹ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.161-162

4.2.3 *Methods of argumentation*

Acting as an advocate for cast-iron architecture, the book started by concluding the critiques brought forward by its opponents. (see chap. 3.1) They were illustrated by the person of Bogardus himself who had been confronted with lots of predictions of failure concerning his first all-iron building, the factory on Centre and Duane Street. This position of victimhood was used smartly to elevate his accomplishment in building the factory, which again served as proof for the abilities of cast iron. It alone is supposed to "embrace the true principles of safety, durability and economy". The long list of advantages therefore comprised "strength, fire safety, lightning safety, resistance against oxidation and decay, the possibility of dismantling and re-erection, easy assembly in any season by the most ignorant workman, inexpensive rich ornamentation" and even "the enlargement of the interior spaces through the smaller thickness of the walls", which can be seen as an early modern economical argument at the moment where the ground in New York started to get scarce and increased in value. The essay further explained that all the advantages of cast iron are only available if they were accompanied by the stability of the structure. As a proof for the ability to create such a structure served the patent of 1850 by James Bogardus, which was explained in detail and in the second edition of 1858 even illustrated with a technical drawing of a typical joint (see fig. 15).¹¹⁰ (see chap. 6.1)

Though it could be seen as a form of advertisement rather than an advocacy of cast iron, the pamphlet stated that James Bogardus was "far from attempting or desiring to monopolize the business" and "ready to grant the privilege to build" also to others.¹¹¹ However there are enough other passages, which served for his advertisement purposes. A list of customers testified his capability in cast-iron architecture. This list even doubled from the 1856 to the 1858 publication and can be seen as a sign for his success.¹¹² A more subtle form of promotion was the constant glorification of Bogardus throughout the publication. He was termed as "architect in iron" as well as "inventor" and "patentee" of cast iron buildings. This was further underscored by the doubtful claim to have erected the first complete cast-iron edifice in the world. (see chap. 5.3.2) An almost mythical aspect was added to his person by a story of his travel through Italy, where he "conceived the idea of emulating [the rich architectural designs of antiquity] in modern times, by the aid of cast iron", which on one hand should add "to our national wealth" by "establishing a new [...] branch of industry" and, on the other hand, "elevate the public taste for the beautiful".¹¹³

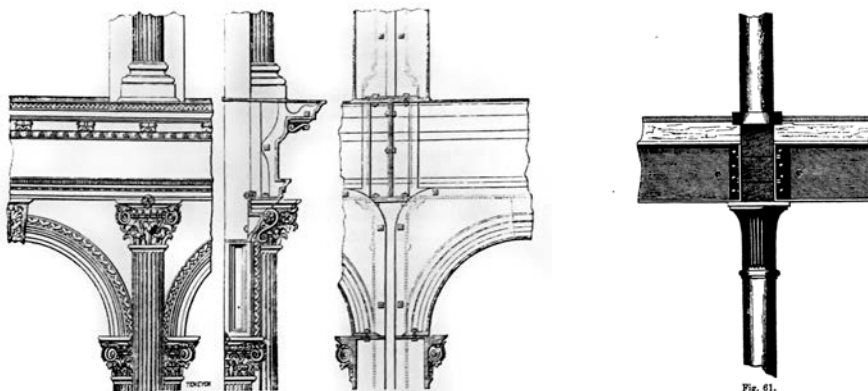


Fig. 15-16: Comparison of the technical drawings of bolted connections between column and beam depicted in the publications by James Bogardus (l.) and William Fairbairn (r.)

¹¹⁰ Bogardus, James: *Cast iron buildings: their construction and advantages*, J.W. Harrison Printer, New York, 1856, p.3-9

¹¹¹ *Ibid.*, p.15

¹¹² Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.174

¹¹³ Bogardus, James: *Cast iron buildings: their construction and advantages*, J.W. Harrison Printer, New York, 1856, p.4 & 9

4.2.4 The use of iconography

James Bogardus didn't release a lot of drawings compared to the other main pioneer Daniel D. Badger, but in the rare cases he did, he was very precise in the points made with them. The first illustration of the publication represented the Factory of James Bogardus. Besides the impressive ornamented cast-iron structure it showed the bustle of Bogardus' business with two smoking chimneys. It was a slightly modified version of a lithograph originally executed by James Ackerman in 1849 or 1850. The main difference was a more urban context due to an additional adjacent house and a busier street scene.¹¹⁴ (see fig. 17) This modified version was published in "The Illustrated London News" already in 1851.¹¹⁵ (see fig. 18 & 19) Interestingly the same lithograph was used a second time in Bogardus' publication with bigger modifications. Large parts of the building were erased to show the stability and safety of the building even in case greater parts would have been removed or destroyed by violence. (see fig. 20)

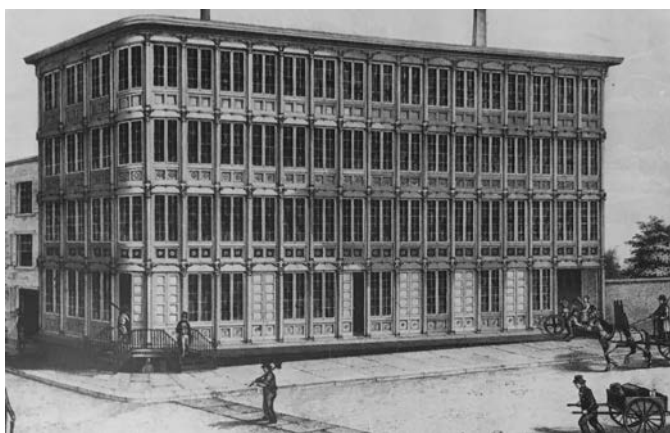
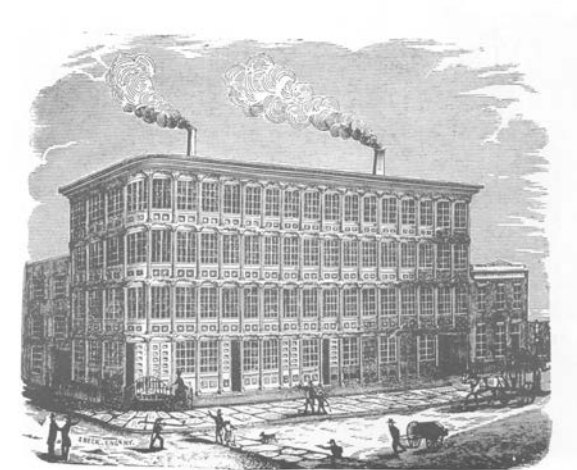
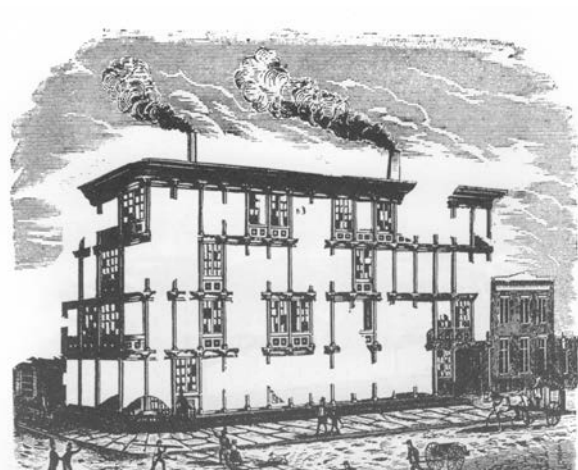


Fig. 17-18: The original James Ackerman lithograph (l.) and a modified version in the London illustrated News (r.)



This plate represents the Factory of James Bogardus, inventor and patentee of Cast Iron Buildings. It is situated at the corner of Centre and Duane Streets, New York, and is the first cast iron house ever erected.



This plate represents one of Bogardus's cast iron buildings, with the greater part of its iron work removed, or supposed to be destroyed by violence; in which demolished condition it will yet remain firm. It is designed to illustrate the strength, stability, and safety, obtained by Mr. Bogardus's method of construction; and also the security against an imperfect foundation: advantages possessed by no other buildings.

Fig. 19-20: The two modified versions of the James Ackerman lithograph in James Bogardus' publication

¹¹⁴ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.84-84

¹¹⁵ *Iron House-Building in New York*, in: *The Illustrated London News*, No.478 - Vol. XVIII, Saturday 12.04.1851, p.1-2

The following three images showed the architectural possibilities of cast iron. The first depicted an unrealized chapel designed by Bogardus and was perhaps thought to make way for the use of cast iron in traditional building typologies. (see fig. 21) The second showed the Harpers & Brothers building, probably his most accomplished building with a rich ornamented facade. (see fig. 22) The last one, an engraving by Richard Ten Eyck, was a jump in scale and depicted a Corinthian capital on top of a fluted column shaft. It illustrated the possible delicacy of ornamentation as well as Bogardus' vision of the emulation of antique designs in cast iron. (see fig. 23)

Besides the illustrations in the pamphlet there are two other examples showing James Bogardus' virtuosity in visual communication. One is an elevation of a circular shaped proposal for the New York Crystal Palace. (see fig. 24) Although his design wasn't chosen, it is an impressive drawing showing the intended transparency of the building as well as the impressive height of the structure.¹¹⁶ The other is the circumstance that he built a model of his all-iron factory, which was exhibited open to the public, before he started to construct the actual building. By this he was able to get attention from early onwards and to popularize the structure before its completion as well as to convince "moneyed gentlemen" to invest in his project.¹¹⁷

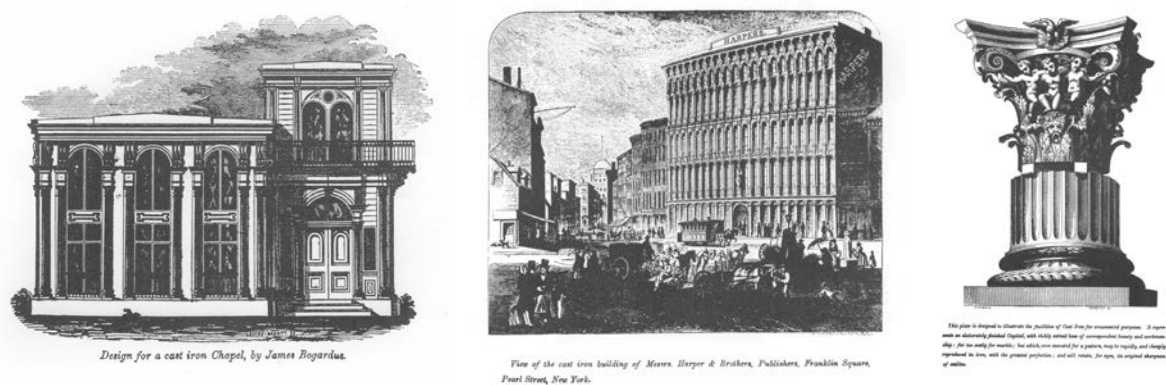


Fig. 21, 22, 23: An unrealized church designed by Bogardus (l.), The Harpers & Brothers building (m.), and the possible delicacy of ornamentation in cast iron (r.)

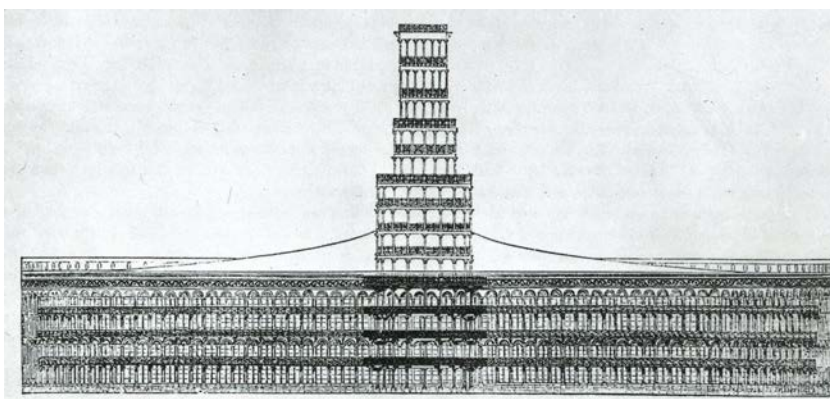


Fig. 24: Design for the New York Crystal Palace by James Bogardus

¹¹⁶ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.116

¹¹⁷ *Ibid.*, p.73

4.3 DANIEL D. BADGER'S "ILLUSTRATIONS OF IRON ARCHITECTURE"

4.3.1 *On the author*

Daniel D. Badger was a self-made man who started as a blacksmith and maker of saws. In 1842 he erected his first cast-iron structure in Boston, which was a ground floor storefront, rather than a complete facade. In 1853 he built his first full front cast-iron building in New York called the "Gilsey Building". The construction was made by a system of facade parts, which could be bolted together, in a similar way to a patent by James Bogardus in 1850. In 1856 he founded the company "The Architectural Iron Works of New York". Testimony of Badgers growing activity gave his 1865 issued catalogue of cast-iron architecture, which showed a lot of plans from mostly built projects by his company.¹¹⁸ According to his obituary in 1884 he was a successful businessman, who also became very wealthy by the use of cast iron for architectural purposes.¹¹⁹ According to William J. Fryer it was Daniel Badger who did the most "to popularize the use of cast-iron fronts".¹²⁰

4.3.2 *The circumstances of the publication*

"Illustrations of Iron Architecture Made by the Architectural Iron Works of the City of New York", as the full original title reads, was issued in 1865. It was published as a large-format hardcover book with a total of 135 printed pages. The first part of the book had 33 pages, which only consisted of text. They contained an introduction by Badger himself, a list of illustrations, a catalogue of the details depicted in the catalogue and a catalogue of the principal works erected by his company until 1865. The second part of the book showed 102 pages of plates printed on one side only by the lithographic process. The size and quality of the publication may have helped to preserve this publication in contrary to smaller ones from other foundries.¹²¹ Daniel D. Badger himself mentioned that the book was "published at a great cost" and gave a twofold reason to do so. On one hand it should serve as an "advertising medium" for his foundry, on the other hand, it should supply "those who may be profited by its study" with "plans and details for the construction [...] of Architectural Iron Structures". He even added, same as Bogardus already did, that it should aid in "improving the public taste".¹²² This could be interpreted, either idealistic as a belief in cast-iron architecture beyond his business interests and the book being created for a broader audience than just other professionals and potential clients, or less idealistic as a skilful use of a public desire for a more refined taste as a way to increase sales.

¹¹⁸ Gayle, Margot in: *Badger's Illustrated Catalogue of cast-iron architecture by Daniel D. Badger*, Dover Publications, New York, 1981, p. vii

¹¹⁹ *Obituary - Daniel D. Badger*, in: *The New York Times*, 19.11.1884

¹²⁰ Fryer, William J.: *A history of real estate, building and architecture in New York City*, Record and Guide, New York, 1898, p.458

¹²¹ Gayle, Margot in: *Badger's Illustrated Catalogue of cast-iron architecture by Daniel D. Badger*, Dover Publications, New York, 1981, p. ix-x

¹²² Badger, Daniel D.: *Illustrations of Iron Architecture Made by the Architectural Iron Works of the City of New York*, Baker & Godwin, NY, 1865, p.9

4.3.3 *Methods of argumentation*

Throughout his book, Badger used different arguments towards the application of cast iron. Some were explicitly written down, while others remained more implicit. The most obvious was a list showing the many technical advantages of cast iron, such as material strength, lightness of structure, facility of erection, less disintegration by exposure to the elements, economy or cheapness in terms of production, permanence and reusability, durability, incombustibility, and easier restoration because of non-absorbent surfaces. This technical-rational form of conviction was complemented by an aesthetical seduction of the reader. He mentioned the architectural beauty as a further advantage of cast iron and explained that it was "capable of finer sharpness of outline, and more elaborate ornamentation and finish" than stone or wood at a comparatively small outlay. It also allowed an individual choice of color and could be repainted.¹²³ The beautiful lithographs of the book implicitly supported and underlined this aesthetical argumentation.

Probably the most convincing argument, at least for potential clients, may have been the impressive list of accomplished works by his foundry, which served as a proof of his achievements. It contained 654 storefronts, whereby 10% were multi-storey storefronts and the other 90% only ground-floor storefronts.¹²⁴ Most of the buildings depicted in the book have actually been built and were cross-referenced to this list, which contained the location of the object, a short description and the name of the client as well as the architect, if one was involved. By this he was also able to show the broadness of possible applications of cast iron, including grain elevators, ferry houses, arsenals, markets or bridges. More advertisement for his business interests than for cast iron as a material was his claim to be the inventor and pioneer of cast-iron architecture. Although he started to build multi-storey iron fronts only 4 years after James Bogardus using the same principle and certainly knew him, he missed mentioning him throughout the whole publication.¹²⁵ He also named himself to be the first person to have used iron as a building material for the exterior in his 1842 storefront in Washington - an assertion provably wrong as the publication by François Thiollet shows Parisian cast-iron fronts already ten years earlier. (see chap. 4.1) He further elevated the story by the anecdote that he would have had to remove the construction at his own expense, if it shouldn't prove success.¹²⁶ However, what surely succeeded besides this first storefront was the control of his image in the eyes of the public.

¹²³ Badger, Daniel D.: *Illustrations of Iron Architecture Made by the Architectural Iron Works of the City of New York*, Baker & Godwin, NY, 1865, p.5-6

¹²⁴ Gayle, Margot in: *Badger's Illustrated Catalogue of cast-iron architecture by Daniel D. Badger*, Dover Publications, New York, 1981, p. ix

¹²⁵ Daniel D. Badger's office was located in the same street as Bogardus' factory and it is reported that James Bogardus used iron shutters by Badgers foundry for the Sun Iron Building in Baltimore. See:

Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.100

¹²⁶ Badger, Daniel D.: *Illustrations of Iron Architecture Made by the Architectural Iron Works of the City of New York*, Baker & Godwin, NY, 1865, p.3-4

4.3.4 The use of iconography

The high quality lithographs of the illustrations in the second part of the book were reproduced by Sarony, Major & Knapp, one of New York's leading firms in this field at that time. The first two plates were multi-coloured and represented Daniel D. Badger's "Architectural Iron Works" as prosperous successful firm. The first one-page frontispiece depicted the firm as a beehive of activity in a fictional factory building. (see fig. 25) It presented all the processes necessary to fabricate a cast-iron building from planning and patternmaking over the casting process itself up to the shop fitting of raw parts and the transportation to the building site. In the background one can see Badger's own office building at 42 Duane Street with a cast-iron facade designed by his staff-architect George H. Johnson.¹²⁷ The second double-page image showed his foundry building at 13th & 14th Street East River in a more realistic manner but still impressive in size and activity. (see fig. 26)

The following 100 plates were a mixture of full cast-iron fronts, cast-iron storefronts, smaller architectural elements and buildings parts. The plates depicting large iron-front structures received a simulation of a monochromatic watercolour wash. They were shown in beautiful elevations often accompanied by horizontal and vertical technical sections as in the example of the Halsey Building in Brooklyn. (see fig. 27) Two of Badger's most important buildings, the already mentioned "E. V. Haughwout Building" of 1856 and the "Gilsey Building" of 1853 - his first multi-storey cast-iron front - were even featured in impressive axonometric drawings. (see fig. 28) They appear as if they would be free standing all iron blocks, although both were corner buildings with "only" two multi-storied cast-iron fronts.

The depictions of the smaller building parts resemble a menu from which one can combine one's own house. (see fig. 29) Especially fascinating is a depiction of the available columns, which resembles the presentations of the classical order of columns in publications of the famous old theoreticians such as Leon Battista Alberti. It almost seems as if cast-iron architecture was embedded into the architectural tradition on purpose and thereby given further legitimation.

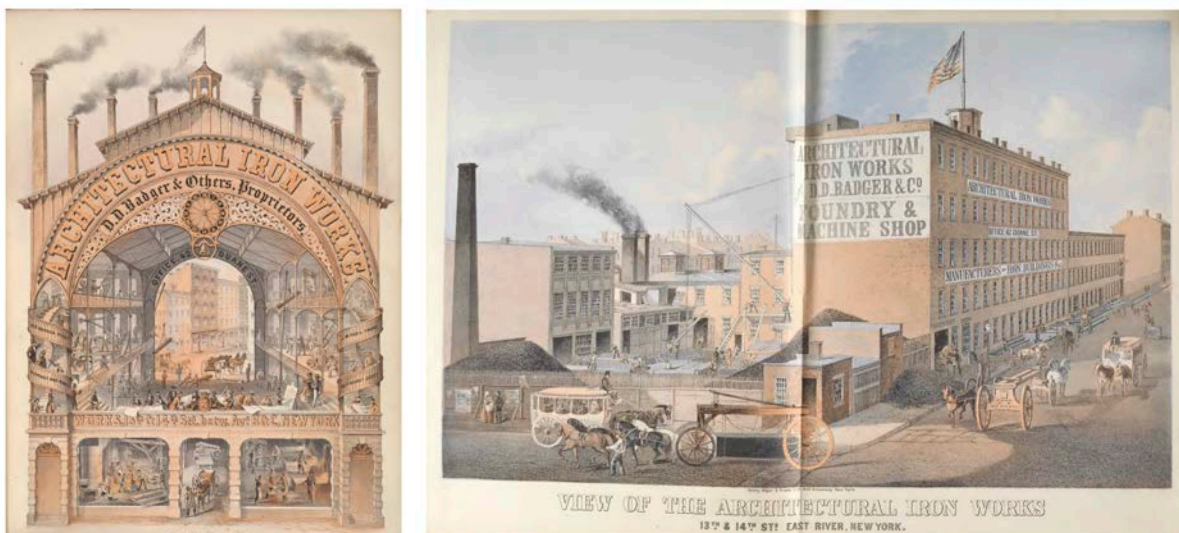


Fig. 25-26: The multi-coloured frontispieces of Daniel D. Badger's "Illustrations of Iron Architecture"

¹²⁷ Gayle, Margot in: *Badger's Illustrated Catalogue of cast-iron architecture by Daniel D. Badger*, Dover Publications, New York, 1981, p. viii

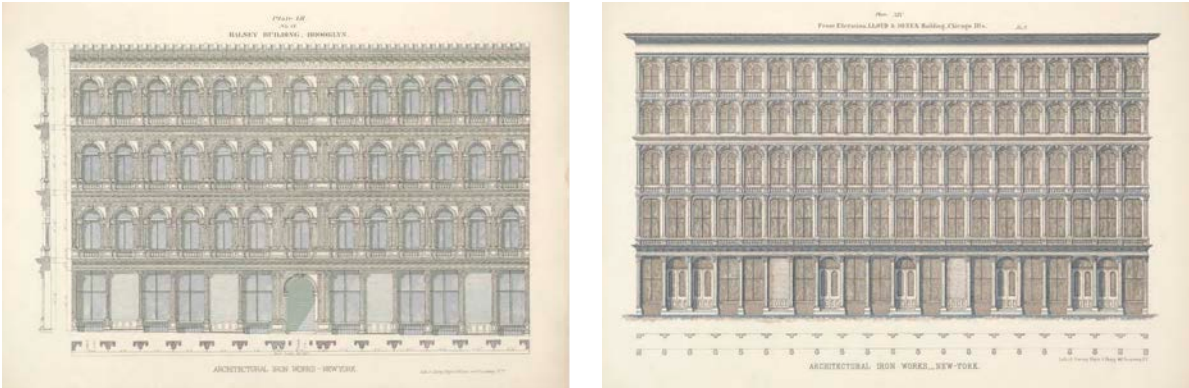


Fig. 27: Elevations of multi-storied iron fronts - Halsey Building (l.) & Lloyd & Jones Building (r.)

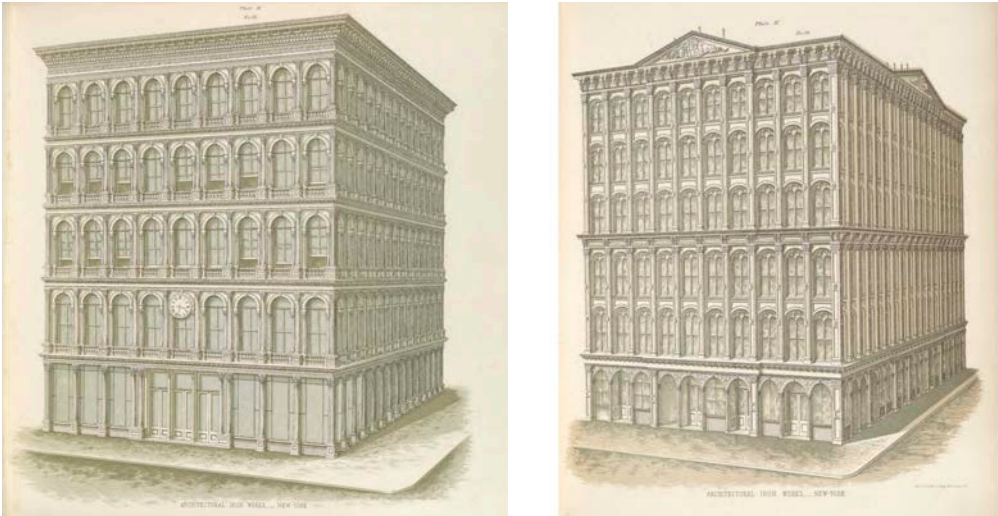


Fig. 28: Axonometric Drawings of multi-storied iron fronts - E.V Haughwout Building (l.) & Gilsey Building (r.)

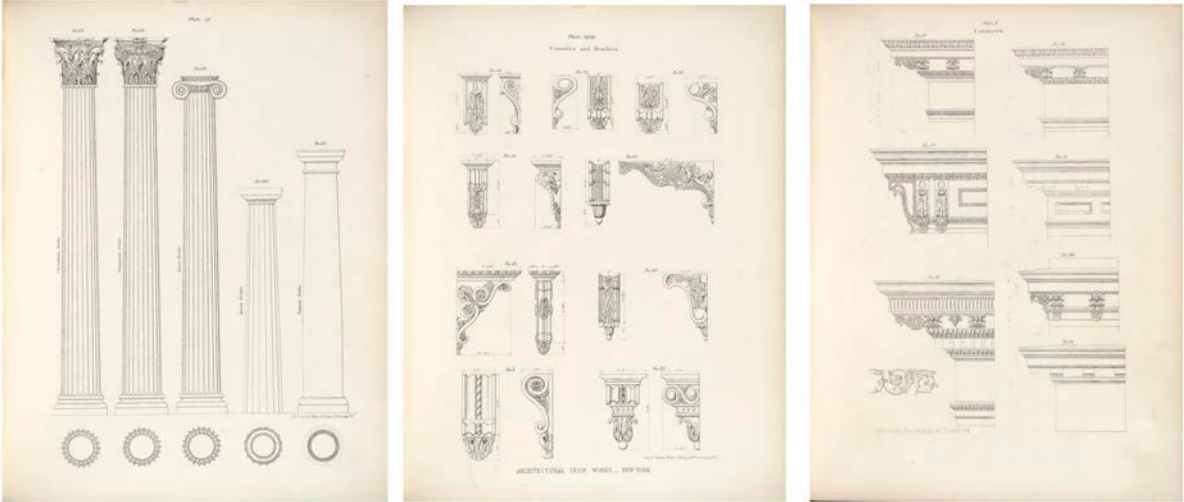


Fig. 29: Detailed drawings of individual building parts

4.4 IMPACT OF THE PUBLICATIONS

The publications must have generated interest and confidence in the capability of cast iron as a building material, since Daniel D. Badger received some of his largest commissions only after the publication of his 1865 catalogue. Besides the impressions these publications obviously made on potential clients they are assumed to have inspired other foundries and professionals to expand their business into cast-iron architecture.¹²⁸ Alongside the smaller pamphlets, which followed by other foundries (see chap. 4), there was especially one follow-up publication by William J. Fryer worth to mention in detail. Fryer was connected with the iron business of New York in several ways - as an architect, engineer and business executive associated with James L. Jackson's foundry in the 1860. He wrote several texts on cast-iron architecture, which, considering his involvement in the cast iron scene of New York, make him one of the more reliable sources of the time.¹²⁹ In 1876 he published the book "Architectural Iron Work: A practical Work for Iron Workers". In the foreword he referred to an enormous expansion of the branch of iron manufacture within the past fifteen years and the growing complexity of the business as the previously distinct divisions of wrought and cast iron started to be brought together in combined establishments. He expected an even greater proportional growth of the iron business in the future. His book therefore was thought to share his knowledge and act as a manual for the "enlightenment and advancement of workingmen" in the iron business.¹³⁰ The content included a broad range of topics from the calculation of costs, amount of work and structural loads over the building laws of New York up to the aesthetically correct design of cast-iron fronts. (see fig. 30) Contrary to the previous publications of the businessmen James Bogardus and Daniel D. Badger, it actually seems to have been a pure educational publication without business interests from the author, as there was no trace of a connection to a specific company in the book. William J. Fryer's book therefore indicates an authentic belief in the material and its popularization rather than an opportunistic desire for economical success. This is further underlined by the last chapter "to young men", which solely was a call for new men to enter the cast iron business.¹³¹ As free access to knowledge and sharing of experience are important for progress and growth, it would be interesting to follow the question whether there was a significant difference in this respect between Europe and America which supported the establishment of cast-iron architecture in America and accelerated the development in the American building industry on the way to the first sky scrapers.

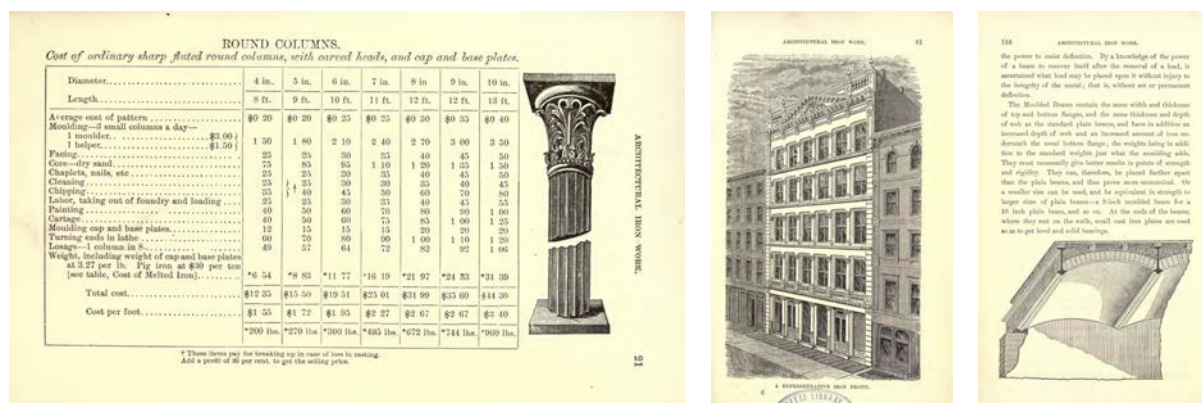


Fig. 30: Pages from "Architectural Iron Work: A practical Work for Iron Workers" by William J. Fryer

¹²⁸ Gayle, Margot in: *Badger's Illustrated Catalogue of cast-iron architecture by Daniel D. Badger*, Dover Publications, New York, 1981, p. ix-x

¹²⁹ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.74

¹³⁰ Fryer, William J.: *Architectural Iron Work: A practical Work for Iron Workers, Architects, and Engineers*, John Wiley & Sons, NY, 1876, p.1-2

¹³¹ *Ibid.*, p.215-220

5. THE PRESENCE OF CAST-IRON ARCHITECTURE IN PERIODICALS

Popular journalism in form of periodicals was a growing sector in the 19th century. "The London Illustrated News" was established in 1842 and introduced the featuring of illustrations to mass media. The English role model was followed by several illustrated periodicals in New York established during the 1850s, such as "Harpers Weekly" or "Frank Leslies Illustrated Newspaper".¹³² Besides these illustrated magazines there were also more serious newspapers, such as the "New York Herald" founded in 1835 or the "New York Times" established in 1851.¹³³ This printed form of mass media was the only platform available for larger public discussions at the time. Therefore they had significance in the formation of opinions over a wide amount of the population. The following chapter tries to show several forms of influence on the reception of cast iron in the eyes of the public.

5.1 POPULAR RECEPTION OF CAST-IRON ARCHITECTURE

As the 19th century was an area of progress and inventions there was a general fascination for technical novelties. The newspapers therefore reported extensively on new and visionary achievements across all fields. Articles on successful and beautiful examples of cast-iron architecture served to promote cast iron as a material for architecture. A report on the opening of James Bogardus' second cast-iron front - the Edgar H. Laing Store - in 1849 exemplifies this public promotion of cast-iron architecture, as it was written after a sort of a press-review at the building. The text praised the strength of the material combined with its beauty, the gain of room and window size compared to a brick building, the ability of relocating the building and concluded mentioning that an adjoining brick building would have cost the same amount of money. It also put forward James Bogardus' Patent and the fact that it was the only building of the kind in the world.¹³⁴ Because of the precise and polemic writing it is assumed to be a press release by John W. Thompson, Bogardus' associate and writer of his later publication in 1856.¹³⁵ Besides the reports on early American cast-iron structures there were also reports on spectacular examples from Europe, often combined with beautiful drawings, which had an immense influence on the opinion towards cast iron. The most important example in this respect was the Crystal Palace in London, which even "has been pronounced the ninth wonder of the world" as soon as it was opened to the public in 1851.¹³⁶ (see fig. 31) The New York Times stated in 1853 that all the critique towards the construction was forgotten immediately after the opening and recalled the time before, when rival architects wrote savage letters to the Times, denouncing Joseph Paxton and warning of the risks of the unstable structure.¹³⁷ Another example was the "New Library of St. Genevieve" in Paris by Henri Labrouste. It was depicted with two engravings in the "Gleason's Pictorial" and considered to be lofty and elegant.¹³⁸ (see fig. 32) Accordingly the critics did not take up against the construction of the later New York Crystal Palace opened in 1854. The opening was widely received and the "Illustrated News" even celebrated it with a special issue and large double-page illustrations.¹³⁹ (see fig. 33) The Palace was praised as being even more beautiful than its European ancestors and was wrongly reported to be the first entire iron structure erected in America.¹⁴⁰

¹³² McNamara, Robert: *Magazines of the 19th Century*, on: <https://www.thoughtco.com/magazines-of-the-19th-century-1773788>, visited 31.07.2018

¹³³ The New York Times: *Our History*, on: <https://www.nytc.com/who-we-are/culture/our-history/>, visited 12.04.2018

¹³⁴ *The Iron Stores*, in: *The Evening Post*, New York, Thursday, 03.05.1849, p.2

¹³⁵ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.84

¹³⁶ *The Crystal Palace*, in: *Gleason's Pictorial*, F. Gleason, Boston, Vol. 1 - No. 14, Saturday 04.10.1851, p.5,

in: *Gleason's Pictorial Drawing-Room Companion*, vol. 1, F. Gleason, Boston, p.213

¹³⁷ *The Crystal Palace - Opening of the Exhibition*, in: *The New York Times*, 15.07.1853

¹³⁸ *New Library of St. Genevieve at Paris*, in: *Gleason's Pictorial*, F. Gleason, Boston, Vol. II - No. 26, Saturday, 26.07.1852, p.12,

in: *Gleason's Pictorial Drawing-Room Companion*, vol. 2, F. Gleason, Boston, p.412

¹³⁹ *Crystal Palace Supplement to the Illustrated News*, in: *Illustrated News*, vol. II - No. 30, New York, Saturday 23.07.1853, p.33-40

in: *Gleason's Pictorial Drawing-Room Companion*, vol.5-6, F. Gleason, Boston, 1853-54

¹⁴⁰ *The Architects of the Crystal Palace*, in: *Illustrated News*, New York, Vol. II - No. 31, Saturday 30.07.1853, p.6

in: *Gleason's Pictorial Drawing-Room Companion*, vol.5-6, F. Gleason, Boston, 1853-54, p.41-47

A report in the "New York Times" on the opening of the "E.V. Haughwout Building" by Daniel D. Badger was titled in 1856: "New Iron Building".¹⁴¹ This shows that although it was becoming more usual to build in cast iron at that time, it was still worth a newspaper article probably due to its spectacularity. Another article on a new cast-iron building around the same time can be found in "Ballou's Pictorial" on the building of Messrs. Parker Fowle & Sons in Boston. Besides the beautiful illustration, it also has an interesting form of argumentation. (see fig. 34) It mentions the marble imitation painted on the cast-iron front as of high skill and that the building would be "a great ornament to the city".¹⁴² This shows that it was more important to the public that a building fit in its surrounding context, rather than having the material "speak for itself" with "honest lead and oil paint", as for example William J. Fryer demanded.¹⁴³



Fig. 31-32: Newspaper depictions of the London Crystal Palace (l.) and the New Library of St. Genevieve in Paris (r.)

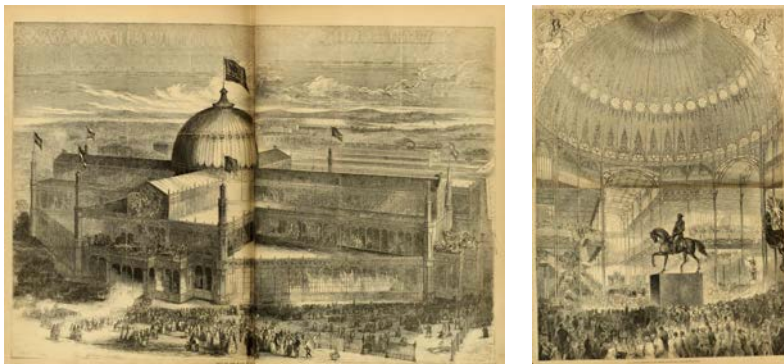


Fig. 33: Large double-page illustrations on the occasion of the opening of the New York Crystal Palace



Fig. 34: Illustration of the new Messrs. Parker Fowle & Sons Building (l.) and another impressive illustration of another similar new cast-iron building (r.) in the same issue of the newspaper

¹⁴¹ *New Iron Building*, in: *The New York Times*, 07.05.1856

¹⁴² *Iron Building - Washington St.*, in: *Ballou's Pictorial*, M.M. Ballou, Boston, Vol. XI - No.3, Saturday, 19.07.1856, p.5
in: *M. Ballou's Pictorial Drawing-Room Companion*, vol. XI, M.M. Ballou Publisher, Boston, 1856, p.37

¹⁴³ Fryer, William J. in: *The Architectural review and American builders' journal*, Vol. 1, Claxton; Remsen & Haffelfinger, Philadelphia, 1869, p.621

5.2 ARCHITECTURE AND ADVERTISING

The popular newspapers, which offered the possibility to reach potential clients in the entire city, opened completely new ways of advertisement. The foundries used it to promote their cast-iron buildings, while their clients used the buildings itself to promote different goods in a similar way.

5.2.1 Advertisements by foundries

The advertisements used by the foundries were of different size and content. Daniel D. Badger's "Architectural Iron Works" used a small classified advertising, which was published weekly in "Harper's Weekly" throughout the year 1860. (see fig. 35) It solely contained the address of the foundry and the small slogan "Fire proof Buildings of every description and every kind of Iron Work for Building Purposes, also for Bridges".¹⁴⁴ An almost similar advertising by James Bogardus can be found in the same newspaper. Besides the address it contained the slogan "Architect in Iron, Originator, Constructor and Patentee of Iron Buildings".¹⁴⁵ (see fig. 36) Other foundries, such as J.B. & W.W. Cornell later on also used larger display advertising showing the address of their foundry in combination with an impressive large depiction of one of their buildings.¹⁴⁶ (see fig. 37)

5.2.1 Advertisements by clients

Interestingly, the clients also used their new cast-iron buildings for promotional purposes. They utilised larger display advertising similar to the one employed by the J.B. & W.W. Cornell iron foundry. Mostly they were published in Newspapers or Visitors Guides to the City. (see fig. 38-42) This combination of a depiction of the company's building and their address was a common practice at that time and also usual with more elaborate stone buildings. In this time of rapid growth, economic expansion and intense competition "no one was embarrassed in flaunting his newly acquired wealth".¹⁴⁷ Therefore it was a matter of representation to show one's own building to the potential customers.

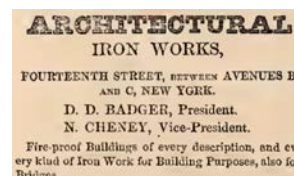


Fig. 35-37: Advertisements by James Bogardus (l.), Daniel D. Badger (m.) and J. B. & W.W. Cornell Iron Works (r.)



Fig. 38-42: Various Advertisements by owners of cast-iron buildings

¹⁴⁴ Badger, Daniel D.: *Advertisement*, published weekly in: *Harper's Weekly*, 1860

¹⁴⁵ Bogardus, James: *Advertisement*, in: *Harper's Weekly*, 22.12.1860

¹⁴⁶ J. B. & W.W. Cornell Iron Works: *Advertisement*, in: *Guide to New York*, T.E. Zell & Co., Hudson River, 1868

¹⁴⁷ New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p.12

Besides these common advertisements there were also exceptional cases, in which companies started to identify themselves with the buildings more strongly. In these cases the building was considered as a proof for the innovation of the client and served as a marketing tool.

The first example is the "Sun Iron Building" in Baltimore, the new headquarters of the "penny press" paper "The Baltimore Sun". James Bogardus and the architect R.G. Hatfield erected the building in 1851. Arunah S. Abell founded the innovative newspaper in 1837 and was always on the search for the newest technical innovations from the Morse telegraph up to cast-iron architecture. The building therefore had to be state of the art in modern house building including artificial illumination, ventilation and elevators and was the tallest cast iron frame structure in America at the time of its completion. Instead of the usual imitation of stone, the building was even coloured in metallic bronze to show the materiality with pride. Shortly after its completion it was featured on two pages in the "Gleason's Pictorial Drawing-Room Companion". It was also used by the Baltimore Sun in the already explained large display advertisements and in 1854 it was even published in a coloured lithograph on the cover of a song called the "Sun Quick Step".¹⁴⁸ (see fig. 43) By this the businesses of James Bogardus and the Baltimore Sun both profited from the advertising effect of the building.



Fig. 43: Pages from the "Sun Quick Step"

¹⁴⁸ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.96-102

The second example is the "Harper & Brothers Building", erected by James Bogardus in 1854 for the "Harper & Brothers" publishing company as a replacement for its previous printing plant, which was destroyed by fire in 1853. Due to the high risk of fire, the new building was designed with the newest state of the art techniques, with the aim to make it fireproof. The pride over the new building led to the invitation of tourists to visit the building and to a publication by Jacob Abbott on the printing plant.¹⁴⁹ "The Harper Establishment, or how the storybooks are made" was written for older children and adults and explains the cast-iron structure of the building as well as the work processes of the printing plant. Abbott laid special emphasis on the technical accuracy of the descriptions of the building and mentioned "James Bogardus (engineer), John B. Corlies (architect & builder) and James L. Jackson (manufacturer of the iron columns and girders)" in the foreword thanking them for their advise and help in writing the book. The book featured several engravings by Carl Emil Doepler including interior and exterior views of the building, technical drawings such as floor plans, sections and details besides all the printing equipment employed in the plant. Especially the section showing the whole building is worth a closer look, because it on one hand depicts the construction of the building in certain accuracy and, on the other hand, shows the beehive of activity in the printing plant.¹⁵⁰ The engraving of the exterior was later on reprinted several times by Harper and also appeared in Bogardus' publication on cast-iron architecture.¹⁵¹ (see fig. 44)

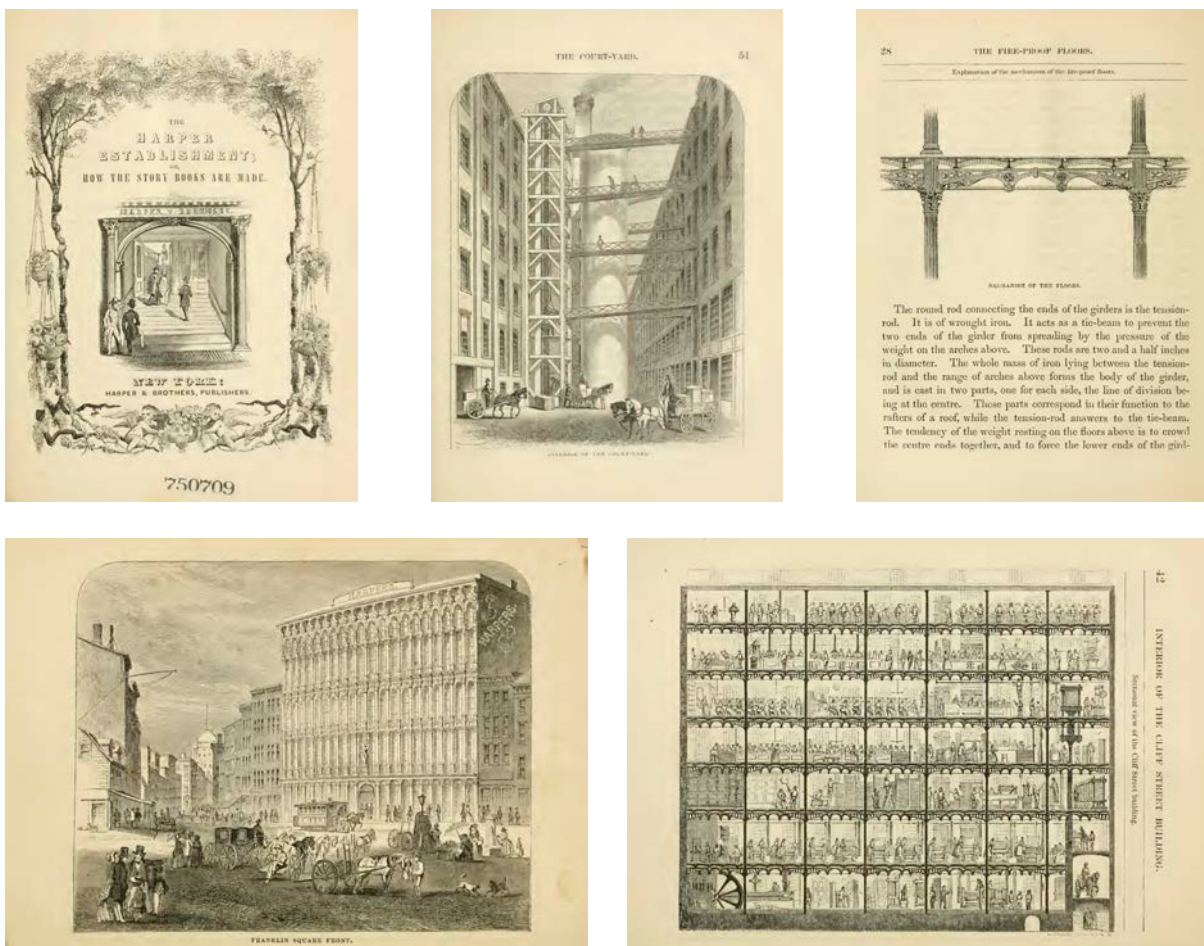


Fig. 44: Pages from "The Harper Establishment, or how the storybooks are made" by Jacob Abbott

¹⁴⁹ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.136-141, 146-149

¹⁵⁰ Abbott, Jacob: *The Harper Establishment, or how the storybooks are made*, Harper & Brothers Publishers, New York, 1855

¹⁵¹ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.146

5.3 PUBLIC DEBATES

The periodicals also served as a forum to discuss professional topics in front of a broad audience. The professionals had the possibility to show their knowledge to peers as well as to the public, including potential clients and business partners. Therefore it can be seen as a matter of reputation to be involved in these discussions and to leave them as a winner. The discussions around topics such as safety were more technical and directed to a professional audience, while others such as a quarrel on the origin of cast iron in architecture were more emotional and directed to a broader public audience.

5.3.1 *Professional discourses*

The initial debates on cast-iron architecture mostly turned around technical subjects such as the combustibility or the expansion and contraction of cast iron. (see chap. 3.1) By the end of the 1850s the built examples had proven the firmness of cast-iron constructions and the debate changed its focus. Presumably inspired by the British discussions around John Ruskin, it started to involve matters of aesthetics, moral legitimacy and truthfulness in the application of the new material. (see chap. 2.3.2) This change can be illustrated by the course of one major public debate at the end of the decade, which was initiated by a discussion between the Architects Henry van Brunt and Leopold Eidlitz, presented by the newly founded "American Institute of Architects". Van Brunt contended that cast iron would express the character of the age and that rather invention than reformation was needed, while Eidlitz replied along the well known lines of critique towards its technical properties, such as the substance, rigidity, heat conduction and combustibility.¹⁵² Though in the aftermath, an editorial of the "Architects' and Mechanics' Journal", titled "Stone vs. Iron", interpreted Eidlitz' statements differently. It claimed that Eidlitz would uphold "the cause of truth, of art and of common sense" and further added, that iron would cause poverty in architectural relief, stereotyped shapes and a paralysis of the invention of the age. It criticized American historicist buildings to force the material into a use for which it is unqualified and mentioned the Crystal Palace as an example of architecture appropriate to the new material. A recent building on New Yorks Broadway was despised as being "designed after studying deeply the sublime beauties of some Gothic ruin, made of sugar, upon a wedding cake".¹⁵³ The design, time of erection, and location lead to the presumption that it meant the "Groover & Baker Sewing Machine Building" of 1859 by George H. Johnson, Daniel D. Badger's staff architect. Shortly afterwards, a reply titled "Iron versus Stone" appeared and defended cast iron along the line of James Bogardus' publication "Cast Iron Buildings".¹⁵⁴ An anonymous author named Vindex, supposed to be John Thompson who has written the texts for James Bogardus' book, wrote the text.¹⁵⁵ This again exemplifies the active public engagement of the cast iron pioneers towards the acceptance of the new material.

¹⁵² Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.192-194

¹⁵³ *Stone versus Iron*, in: *The Architect's and Mechanics' Journal*, November 1859, p.28-29

¹⁵⁴ *Iron versus Stone*, in: *Architects' and Mechanics' Journal*, 24.13.1859, p.75

¹⁵⁵ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.194

5.3.2 *Popular discourses*

These public restraints towards the novelties of cast-iron architecture were not only driven by rational concerns, but sometimes also by a general conservative scepticism that led to debates on a more emotional than factual basis. Published in newspapers rather than in professional journals, these can be seen as means to convince the public, including potential customers, of the need to build in cast iron. One argument was the historical justification of the necessity of progress. An article of 1854 stated that, "all great inventions of modern times involve some new application of iron" and further claimed that, "iron is the basis of the world's material prosperity, and its [...] consumption a measure of the civilization of nations".¹⁵⁶ William J. Fryer took the same line and stated in 1869, that "Iron [...] is ready to supplant stone, just as history relates, stone supplanted mud in the construction of dwellings for men" and he even demanded the use of iron by purporting that "it is a duty for every builder, to do the most with his money and the most for art".¹⁵⁷ A special case was the quarrel on the claim of origin of cast-iron architecture. It can be seen as a form of promotion, not for cast iron itself, but rather for the actors themselves as it was driven by the aim to be conceived as the most important and experienced pioneer before the eyes of the public. Besides the claims in the pioneers' publications (see chap. 4), there were also allegations in the "penny press". In 1851 William D. Wallach, briefly associated with James Bogardus' firm as a publicist and agent, published an article, asserting that the London Crystal Palace was essentially an American invention constructed by the principle conceived by James Bogardus.¹⁵⁸ A claim that was directly recited multiple times in other newspapers before it appeared again in a larger public quarrel on this topic in the "New York Times".¹⁵⁹ Triggered by an article on the opening of the New York Crystal Palace in 1853, which stated that "no edifice entirely of iron yet existed in the United States", James Bogardus replied rapidly insisting on his factory being the first entire cast-iron building in the world and stressing the fact, that it had been published in London "even before the London Crystal Palace was in contemplation".^{160,161,162} The following day a James Rodgers claimed to have been involved in the construction of an even earlier cast-iron building.¹⁶³ An H.L. Stuart, personally acquainted with both, then ended the discussion, by denying the iron structure of Rodgers the status of an actual building and again stressing an article on Bogardus' Factory in the "London Times". He even polemicized that "James Bogardus, rather than Joseph Paxton, should have been knighted, if originality goes for anything".¹⁶⁴ Nevertheless, all the aforementioned articles missed the fact that William Fairbairn already constructed an all-iron Flour Mill in 1839, which was prefabricated in London and afterwards shipped to Constantinople. The historian Bannister Turpin even suggests, that Bogardus might have seen the factory during his time in London and got his inspiration from it, for it was exhibited open to the public before shipping.¹⁶⁵

¹⁵⁶ Colwell's Iron Building - Revolution in Architecture, in: *Weekly National Intelligencer*, Washington DC, Saturday 09.09.1854, p.8

¹⁵⁷ Fryer, William J. in: *The Architectural review and American builders' journal*, Vol. 1, Claxton; Remsen & Haffelfinger, Philadelphia, 1869, p.622

¹⁵⁸ Wallach, William D.: *Editors Correspondence*, New York, 07.06.1851, in: *Weekly National Intelligencer*, Washington D.C., Sat. 14.06.1851, p. 7

¹⁵⁹ *Cast Iron Buildings - An American Invention*, in: *The Pittsburgh Gazette*, Pennsylvania, 18.06.1851, p.4; AND

Cast Iron Buildings - An American Invention, in: *The Brooklyn Daily Eagle*, NY, 23.06.1851, p.2

¹⁶⁰ *The Crystal Palace - Opening of the Exhibition*, in: *The New York Daily Times*, 15.07.1853

¹⁶¹ Bogardus, James: *Cast-Iron Buildings*. To the Editor of the *New York Daily Times*, in: *The New York Daily Times*, 28.07.1853

¹⁶² *Iron House-Building in New York*, in: *The Illustrated London News*, No.478 - Vol. XVIII, Saturday 12.04.1851, p.1-2

¹⁶³ Rodgers, James: *Cast Iron Buildings*. To the Editor of the *New York Daily Times*, in: *The New York Daily Times*, 29.07.1853

¹⁶⁴ Stuart, H. L.: *Cast Iron Buildings*. To the Editor of the *New York Daily Times*, in: *The New York Daily Times*, 03.08.1853

¹⁶⁵ Bannister, Turpin C.: *Bogardus Revisited*, 1956, in: Thorne, Robert: *Structural Iron and Steel 1850-1900*, p.52

6. THE SIGNIFICANCE OF PATENTS

Compared to the unsupported claims in publications, patents were a more respectable way of claiming innovation and proving the originality of the patent owner. They were able to legitimize the owner as a trustworthy reputable businessman and could act as an ostensible guarantee for the ability of constructing a safe building in cast iron without any previous proof of success in actually doing so. Ownership of a patent further allowed the holder to publish his drawings for marketing purposes without the risk of copycats stealing his techniques. Thus, the cast iron pioneers James Bogardus and Daniel D. Badger used their previously obtained patents both in their publications and in advertisements.^{166,167} As we will see in the following chapter, at times it therefore almost seems that having a patent to one's name was more important than its actual content was.

6.1 TECHNICAL RELEVANCE OF PATENTS

The first relevant US-patent for cast iron architecture was granted to James Bogardus in May 1850. (see fig. 45) The document titled "construction of the frame, roof, and floor of iron buildings" included three key aspects of his building system.¹⁶⁸ Besides two methods for the construction of iron floors and roofs also the construction of a strong and rigid iron frame, consisting of columns and girders bolted together through end-flanges, which seems to have been the most important part of the patent. Though two important points he applied for, where rejected by the patent office. The use of "open beams", also called I-beams, which enabled a lightweight construction and the modular construction of the facade, which was central to the idea of a prefabricated architecture. It seems that Bogardus achievement lay in bringing together already available methods to a new whole and that the patent therefore missed out on the core of his actual invention, the self-supporting historicist cast-iron facade. The historian Margot Gayle stated: "[...] precisely because it mirrored contemporary technology and taste to meet contemporary demands, that is, because the moment was ripe for cast-iron architecture, it was probably not really patentable at all".¹⁶⁹

During the 1850s followed ten more US-patents by other competitors related to cast-iron front construction.¹⁷⁰ Among them was one granted to Daniel D. Badger in August 1855, ambitiously titled "iron house", which basically only included an improved system of connecting cast-iron members by flanges compared to the one already patented by James Bogardus.¹⁷¹ It appears that the competitors tried to avoid using Bogardus' patent by slightly altered own patents without real technical relevance. Bogardus pamphlet of 1856 then also stressed the evasion of his rights by unnecessary complicated substitute patents. It further cautioned that some of them even would be absolutely dangerous, while others would require much more iron than actually needed and therefore raise the building costs.¹⁷²

¹⁶⁶ Bogardus, James: *Advertisement*, in: *Harper's Weekly*, 22.12.1860

¹⁶⁷ *Patent Revolving Iron Shutters by D. D. Badger & Co*, in: *D. Badger's Illustrated Catalogue of cast iron architecture by Daniel D. Badger*, p. vii

¹⁶⁸ Bogardus, James: *construction of the frame, roof, and floor of iron buildings*, U.S. Patent 7,337 issued 07.05.1850

¹⁶⁹ Gayle, Margot & Carol: *Cast-iron architecture in America: the significance of James Bogardus*, W.W. Norton & Company, NY, 1998, p.86-89

¹⁷⁰ Bannister, Turpin C.: *Bogardus Revisited*, 1956, in: Thorne, Robert: *Structural Iron and Steel 1850-1900*, p.59 note 60

¹⁷¹ Badger, Daniel D.: *Iron House*, U.S. Patent 13,379 issued 07.08.1855

¹⁷² Bogardus, James: *Cast iron buildings: their construction and advantages*, J.W. Harrison Printer, New York, 1856, p.15

6.2 ECONOMICAL RELEVANCE OF PATENTS

Although patents are thought as a way to secure an adequate economical share to the inventor, they don't seem to have been a relevant source of income for the cast iron pioneers, as the evasions of Bogardus' patent shows. Bogardus himself claimed to be far from a desire to monopolize cast-iron architecture and therefore ready "to grant the privilege to build, for a fair remuneration [meant is remuneration], so small as to leave no inducement to infringe his rights as the inventor".¹⁷³ Although his fee of 200\$ (approx. 5'800\$ in 2018)¹⁷⁴ for a building was relatively modest, there were still infringements to his patent, as the case of an iron Bell Tower on the Mount Morris in Harlem exemplifies. After a lawsuit on this infringement, which took over a year, he was finally compensated with a rather small sum of only 280\$.¹⁷⁵ As the patents only turned around relatively small amounts, their main relevance was supposedly rather a matter of reputation for its holder.

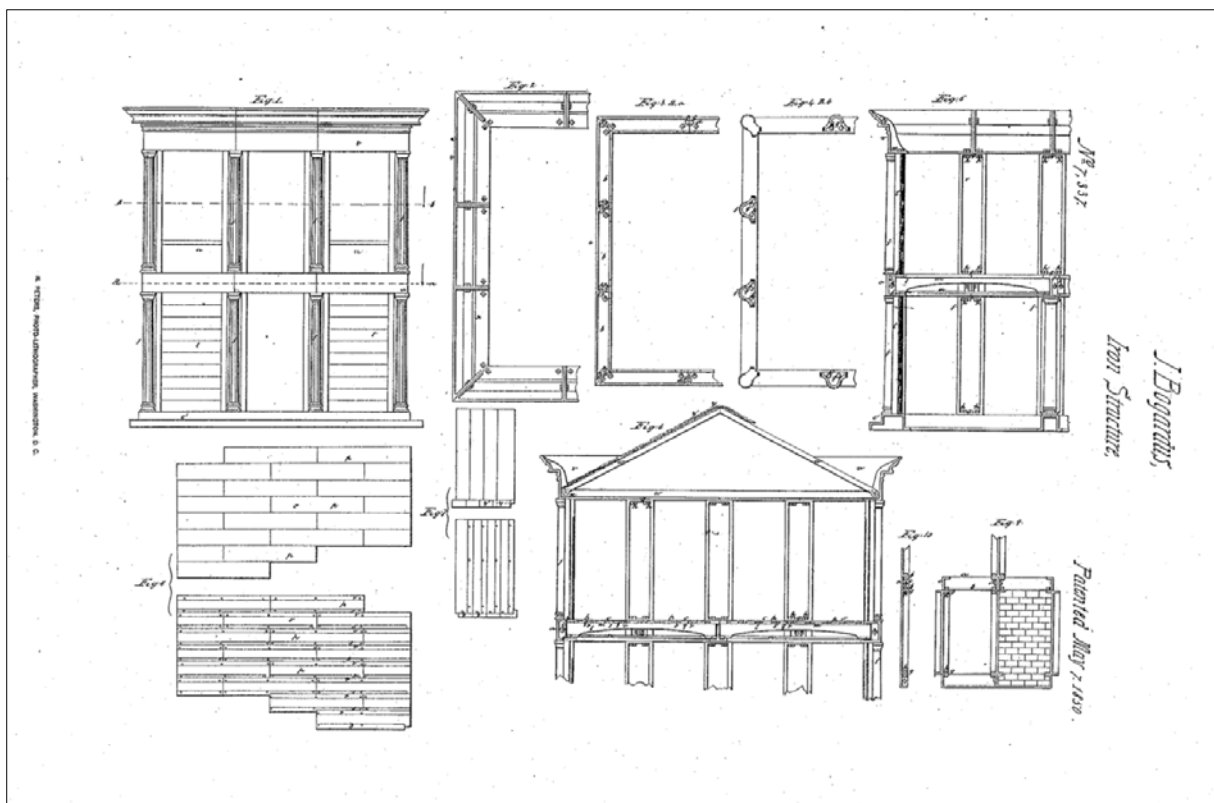


Fig. 45: U.S. Patent 7,337 "construction of the frame, roof, and floor of iron buildings" by James Bogardus

¹⁷³ Bogardus, James: *Cast iron buildings: their construction and advantages*, J.W. Harrison Printer, New York, 1856, p.15 & Bogardus, James: *Advertisement* in: *New York Daily Tribune*, 15.07.1855, p.2

¹⁷⁴ CPI Inflation Calculator: <https://www.officialdata.org/1855-dollars-in-2018?amount=1>, visited 16.08.2018

¹⁷⁵ *Law Intelligence* in: *The New York Daily Times*, 10.04.1858, p.2

6.3 THE QUESTION OF AUTHORSHIP

While patents are able to clarify the ownership of construction techniques, attributing authorship and copyright to cast-iron designs remains problematic. This can be shown by the example of Daniel D. Badger's foundry "The Architectural Iron Works". As a clever businessman Badger did not just rely on the functional advantages of cast iron and therefore employed an entire architectural department headed by George H. Johnson.¹⁷⁶ The task of these staff-architects was to design stock parts and to serve as consultants to architects ordering cast-iron facades from the company.¹⁷⁷ Johnson therefore had an important influence on the design of the buildings produced by the foundry, whenever he was involved. This complicates the attribution of authorship in projects accompanied by him.

The "E. V. Haughwout Building" in New York and the "Halsey Building" in Brooklyn, both erected by Badger's foundry, exemplify this problem. John P. Gaynor is recorded as the official architect of the "E.V. Haughwout Building" and according to Andrew Scott Dolkart it's the only building attributed to him in New York.¹⁷⁸ Though Margot Gayle also attributes the "Halsey Building" to him, based on an advertisement of his office mentioning the building in 1857. The building lost today was designed with the same cast-iron modules as were used for the "E. V. Haughwout Building", but with a different cornice on top.¹⁷⁹ In Badger's catalogue Gaynor is listed as the architect of the "E. V. Haughwout Building", whilst in the case of the similar "Halsey Building" it's Johnson who is listed as the architect. This raises at least the question of who has been the actual designer of the facade of the building, although there may be no question that the main architect planned the basic substructure of a building and probably determined the general formula to be followed on its facade.¹⁸⁰ Whatever the circumstances exactly have been, it is to assume that the cast iron foundries and their staff-architects¹⁸¹ had a major influence in the design of cast iron facades and their details.

Especially with such parts it was uncertain who has been the designer and therefore owned the copyright to use them, albeit this was of special importance in cast-iron architecture, because the moulds used for castings could easily be reused in another building. The architect therefore bore the risk that the foundry used his moulds on other occasions without paying for the design. A capital abacus that is typical of the work of the architect Henry Fernbach for example was used by the Cornell Iron Works in collaborations with other architects as well.¹⁸² Another case shows the blurred circumstances not only between the architect and the producer of the iron parts, but also between the owner of the foundry and the employed staff-architect. In the case of the Stearns Block in Richmond, Virginia where George H. Johnson has been the proven architect with drawings even published in Badger's catalogue, though the contracted company has been the "Hayward, Bartlett Foundry" from Baltimore and not Badger's "Architectural Iron Works". The open question therefore is if the drawings belonged to George H. Johnson or whether he had to lease them from Daniel D. Badger.¹⁸³

¹⁷⁶ Johnson was born in Manchester, England in 1830 and worked as a young and energetic builder for Badger from 1852 until around 1862. Examples of his work in Badgers Company are the plans for the Haughwout and Halsey Building, as well as a gothic revival facade for the now lost Grover and Baker Building, which might have been influenced by his English origin. See:

Brown, William J.: *George H. Johnson*, on: <http://american-colossus.blogspot.ch/2009/04/george-h-johnson.html>, visited 21.08.2018

Miller, Tom: <http://daytoninmanhattan.blogspot.com/2016/12/the-lost-grover-baker-bldg-no-495.html>, 2016, visited 15.08.2018

¹⁷⁷ New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p.12

¹⁷⁸ Dolkart, Scott A.: *Gaynor, John P.*, in: Marter, Joan M.: *The Grove Encyclopedia of American Art*, Vol.1, Oxford University Press, NY, 2011, p.312

¹⁷⁹ Gayle, Margot in: *Badger's Illustrated Catalogue of cast-iron architecture by Daniel D. Badger*, Dover Publications, New York, 1981, p. xv

¹⁸⁰ New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p. 12

¹⁸¹ The general plural is used, because presumably other New York based cast iron companies which are less documented than Badgers Architectural Iron Works had similar staff architects, as is stated in:

New York Landmarks Preservation Commission: *SOHO - Cast Iron Historic District Designation Report*, City of New York, 1973, p. 12-13

¹⁸² *ibid.*

¹⁸³ Gayle, Margot in: *Badger's Illustrated Catalogue of cast-iron architecture by Daniel D. Badger*, Dover Publications, New York, 1981, p. xiii

7. CONCLUSION

The use of cast iron in architecture can be seen as a result of the industrial revolution and the accompanying economical processes. Thus a result of progress and technical innovation, the material incorporated several rational reasons to be applied in architecture. Among those were technical advantages such as the improved incombustibility compared to other available materials of the time and economical advantages such as the inexpensive availability of ornamentation. But still there were several objections against the new unfamiliar material, which had to be overcome on the way to its establishment. On one hand there were rational concerns towards its stability and material properties, still underexplored at the time of its introduction, on the other hand, there were more emotional and conservative resistances to the unknown in combination with a moralistic rejection of imitating traditional stone buildings in iron. Therefore it needed clever strategies of legitimization and mediation to eventually surmount this initial scepticism and establish cast iron as a common primary building material. As the industrial revolution and the introduction of divided labour also changed the roles in the building industry, it was the foundry-owners with expert knowledge in manufacturing the new material that became the dominant drivers in the establishment of cast-iron architecture. Due to their economical interests, these people were especially keen to overcome the concerns of the public and potential clients towards the use of the new material.

By the means of own publications they established their own narrative of the material and themselves in order to popularize the material and at the same time their own business. These books contained a combination of hard facts and seductive images seeking to create an impressive overall image. Further they engaged actively in the newly available media such as the penny press in the forms of technical debates on themes like the combustibility of iron, emotional debates on the origin of cast-iron architecture and even advertisements to reach a wide audience. Besides the printed efforts they used the built architecture itself as a means of persuasion. The form of the architecture was less a choice of form according to the material, but rather the intentional use of visually appealing and accepted forms to undermine the scepticism against the new inconvenient innovation. The use of neo-styles, which were common for the stone buildings of the time, made the new material look familiar to the public and the ownership of a cast-iron building eventually even desirable.

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