Amsterdam’s Crystal Palace – a forgotten example of British engineering (1858-1864)

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Abstract

This paper’s theme is the construction of the Amsterdam Crystal Palace (Paleis voor Volksvlijt), an exhibition building inspired by London’s Crystal Palace. The Amsterdam palace was built between 1858 and 1864 only to burn to the ground in 1929. Although during and after construction the initiators took pains to make it look like a product of Dutch industry, it could not have been built without English input. Architect Cornelis Outshoorn and the initiators did not reveal that they had called on London-based engineers Rowland Mason Ordish and William Henry Le Feuvre for the structural calculations. The iron for the main structure also came from England: from foundries in York and Birmingham. Dutch foundries only joined in immediately prior to completion of the main structure, making it look as if the Amsterdam building was a product of Dutch industry. Due to Cornelis Outshoorn’s ill-considered design, construction in Amsterdam took no less than six years. The preserved ironwork specifications, which total some 55 pages, provide insight into the complicated construction concept, which consisted of many unique components. As a result, serial production was impossible.

Keywords

Iron architecture, Iron production, Amsterdam, Ordish & Le Feuvre, Cornelis Outshoorn, Paleis voor Volksvlijt, exhibition hall

Introduction

In January 1860, The Builder and English newspapers reported that the construction details of the ‘Amsterdam Crystal Palace’ had been entrusted to ‘Mr. R.M. Ordish, of Great George-street, Westminster’.1 The architect was Cornelis Outshoorn, a Dutch railway engineer, who initially received a great deal of praise after the opening of the building in 1864. The construction of the Amsterdam Palace was presented as a purely Dutch affair and the English contribution to the construction design was deliberately concealed. The fact that English factories supplied the material for the main construction was also kept quiet. Instead, a number of Dutch producers of iron claimed the honour for themselves.

In the following paper I will discuss the question why it took no less than six years to build the ‘Paleis voor Volksvlijt’ and what consequences the desire to create a beautiful design had on the production of the individual components. In addition, we will discuss which parts of the Palace have been supplied by English and which by Dutch iron manufacturers. Finally, we will consider how the building, which was iconic for the Netherlands, was publicly framed and to what extent the propaganda made at the opening has influenced its image in historiography and public perception to this very day.
Iron production in the Netherlands

During the Congress of Vienna in 1815 it was decided that the Northern and Southern Netherlands would be merged into the Kingdom of the Netherlands. The new King William I had set himself the goal of speeding up the industrial progress of his country. In the first half of the nineteenth century, almost all the iron production in the Low Countries was concentrated in the south. There, in Wallonia, infrastructure was created and an iron industry developed. William I invested huge sums of money in machine factories. Nevertheless, there was dissatisfaction among the southern producers: the government in The Hague pursued a free trade policy that made it possible for products from English and Swedish factories to enter the country, without having to pay high import duties. The producers in Wallonia wanted the government to be more protectionist. Moreover, Holland had a considerable national debt, with the Dutch dikes costing a lot of money. The Calvinism of the Dutch caused a deep cultural gap with the Catholic South and, on top of that, the Dutch had little incentive to appoint the Catholic Southerners to high posts. What initially began as administrative independence grew into an uprising, which, after some clash of arms, led to a secession from the south in 1831. In 1839, King William I finally recognised the existence of the state of Belgium.

Until the secession of Belgium, The Hague regarded Wallonia’s industry as simply Dutch, but after 1839 this was no longer the case. One of the measures to compensate for this was to reduce the import duties on pig iron, so that Dutch traders could make up for the loss of supply from the south with overseas imports. For some long-standing foundries in the north, the separation from Belgium was a reason to invest and expand. In 1830, L.I. Enthoven established a lead crushing and pulling plant in The Hague and shortly afterwards the company began to focus on bullets, bombs, grenades, lead pipes, sheet iron, anchors and cast iron for safes. In 1834 D.A. Schretlen founded an iron foundry in Leiden, followed in 1840 by an iron foundry called ‘The Prince of Orange’ in The Hague, which was also to use imported pig iron. Some machine factories set up their own foundries. All over the country, the first products of this new industry were seen: grave monuments, village pumps, fountains, lampposts and fences, but also cast iron wall anchors and spiral staircases.

Investments and plans

Although Enthoven supplied several swing bridges for the railway lines Amsterdam-The Hague and Amsterdam-Utrecht in 1844, Dutch entrepreneurs were hardly able to compete with foreign companies. For large projects the help of English, French or German engineers or firms was regularly sought. In the Netherlands there was a lack of entrepreneurial spirit and a lack of willingness to invest. The dune water pipeline supplying drinking water to Amsterdam, which was built with English capital and English business knowledge, is a telling example. The largest investors in this project were the Duke of Portland and the London lawyer Arthur Robert Adams. The latter also became commissioner of the water supply company, along with civil engineers William Tierney Clark and Joseph Quick, and Thomas Moxon, a London-based broker. The machines and pumps for the water supply were supplied by The Butterley Iron Works, Derbyshire. English engineers John Aird, Charles Burn and Bland William Croker were in charge of the project, supervising the construction of a 3,500-metre-long, 13-metre-wide canal, a steam engine and a 23-kilometre-long pipe system. The Dutch press reported fears that more companies would eventually come into the hands of English investors.

One of the people who wanted to wake up the Netherlands from its dormant situation, was Samuel Sarphati. (Fig. 1)
Sarphati was born in 1813, had studied medicine in Leiden and defended his doctoral thesis in 1839. As a general practitioner for the Portuguese-Israeli Congregation, he knew the harsh situation in which many Amsterdammers found themselves. The city was weighed down by an unbearable stench of sulphur, dirt and decay.\(^6\) In the summer of 1851 Sarphati undertook a trip to Brussels, Paris and London to study public hygiene, medical assistance and the condition of hospitals and institutions to learn how he could improve conditions in Amsterdam.\(^7\) Once in London, he made many visits to the Great Exhibition of all Nations, and was very annoyed by the embarrassing presentation of the Netherlands. Of the approximately fourteen thousand entries, only 114 were from the Netherlands. When prizes were awarded for the best entries at the Great Exhibition, the Netherlands ended up at the bottom of the list of honour, together with the Vatican. Although there were some honourable mentions for entries from Dutch companies, the Netherlands had not presented any truly modern products that could be industrially manufactured.\(^8\)
Together with a few others, Sarphati decided to erect an exhibition building in Amsterdam which should serve as an incentive for Dutch entrepreneurs to develop innovative, modern products. To achieve this goal, the Vereeniging voor Volksvlijt was established in 1852. Sarphati became director, Salomon Bleekrode and Winand Staring became co-directors, with Jan Adriaan van Eijk acting as secretary. These three collaborators had also visited the Great Exhibition. The King’s Commissioner and the Mayor of Amsterdam expressed their support, but the most important milestone in the early days of the Society was that Prince Frederick, a brother of the King, was willing to become patron. This patronage was modelled on the English Society of Arts, of which Prince Albert, Queen Victoria’s husband, was the president.

The design

Paragraph 3, art. 16, of the Vereeniging’s rules stipulated that an exhibition building should be built in Amsterdam, a place where objects ‘can be displayed in public’. As elsewhere, London’s Crystal Palace was the great example. On 7 February 1854, Sarphati turned to the king, asking for his approval and support for the building, an event probably facilitated by the mediation of patron Prince Frederick. After a new alderman of the Public Works Department took office in September 1854, Sarphati submitted a request for a building site, where an earlier request had been rejected. The new alderman, I.S. Warnsinck, was a fervent advocate of the development of Dutch architecture, secretary of the Maatschappij tot Bevordering der Bouwkunst, the Society for the Promotion of Architecture, founded in 1842, and one of the first professional architects in the Netherlands. By the 1840s he had already studied improvements in building in England and Scotland, and he was well aware of the latest developments.

In March 1855, the Amsterdam city council decided to provide a plot of land near a town gate, the Utrechtsepoort. A supervisory board was set up, including the mayor of Amsterdam, the managing director of De Nederlandsche Bank, the managing director of the Nederlandsche Handel-Maatschappij, members of the Senate and other prominent directors, and the Amsterdam alderman Warnsinck. Industrial and municipal councillor Paul van Vlissingen was also a member and a little later another industrialist, Herman Adriaan van den Wall Bake joined the group. Both men were to be of great importance for the success of the entire enterprise. The prospectus and the articles of association that were subsequently drawn up had one main objective: to find money. A total of one million guilders had to be raised in order to be able to start construction. The registration was a resounding success, as if everyone had learned from the problems with the realisation of the dune water supply, and within a day thirteen hundred bidders had seized the opportunity to lend money to Sarphati’s ambitious enterprise.

After the first general meeting of shareholders in August 1856, the board of directors decided to launch an architectural competition on 1 September under the leadership of alderman I. Warnsinck, city architect B. de Greef Jzn and independent architect A.N. Godefroy. They had clear ideas about the future of architecture, considering technical innovations as a means to develop architecture, and through the Bouwkundige Bijdragen, the magazine of the Maatschappij tot Bevordering der Bouwkunst, they exchanged knowledge with other architects, often with foreign contributions. A scientific approach distinguished the architect from the artisan and because of their theoretical training, architects were able to build more efficiently and cost-effectively: at least in theory. The clients had a long list of desired specifications for the design. In the competition it was stated that the entrants should design a building that was solid and elegant, and as fireproof as possible. It was to have a monumental entrance building, with a vestibule, reception rooms for the royal family and rooms for the management and administration offices as well as dwellings for the caretaker and staff and meeting rooms. Then there had to be about twenty rooms for libraries, art collections and permanent and changing exhibitions. Finally, a central
exhibition hall of approximately seven thousand square metres was to be built. In addition to a monumental appearance, the building had to be equipped with building services including heating and ventilation. All the entrants were also required to provide a rough estimate of the costs involved.\textsuperscript{17}

Although it is nowhere stated explicitly it is clear that Sarphati had a kind of miniature Crystal Palace in mind. This is also evident from his 1855 remark, when he said that the construction of an exhibition hall could take place in a short period of time, referring to the experience of building such structures in London and Munich.\textsuperscript{18} On 1 January 1857 ten entries were anonymously submitted but only a few of these were later revealed. One of the entrants was architect Cornelis Outshoorn. Outshoorn designed a building that consisted of three parts, with a stone front building containing a square at its centre, behind it a corridor and behind the corridor an elongated exhibition hall of iron and glass. His design was judged to be commendable, but together with three other designers – whose names are not known – he came second. Architect A.J. Sevenhuijsen had submitted a design for a building made of iron and glass under the name ‘Kohinoor’. The jury considered Sevenhuijsen’s design one of the best.\textsuperscript{19} (Fig. 2) However, Sevenhuijsen was not commissioned to build the exhibition hall as in the end it was decided that his design had not fully met the content of the programme.

Despite his initial design being rejected, it was architect-engineer Cornelis Outshoorn who won the competition. Outshoorn was born in 1812 and started his career as a carpenter’s companion in Leiden. He took lessons at the drawing academy in The Hague and worked for the Royal Steamboat Company at Fijenoord in Rotterdam, where he became the foreman of the model forge. In 1838 he joined the \textit{Hollandsche IJzeren Spoorwegmaatschappij} (HIJSM), which a year later would open the first railway in the Netherlands, between Amsterdam and Haarlem. Together with railway pioneer F.W. Conrad, engineer and director of HIJSM, he designed the first Dutch station buildings in Amsterdam and Haarlem and sent in two models of bridges for The Great Exhibition in London in 1851, an entry that was not awarded a prize. Conrad and Outshoorn also took part in the competition for the exhibition building in London. In this respect they formed a Dutch ray of hope, for their design received one of the seventy honourable awards from the English jury.\textsuperscript{20} In 1854 Outshoorn was also responsible for the design of the new Royal Post Office of Amsterdam on the Nieuwezijds Voorburgwal. He provided the middle part of

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the new building with an enormous glass roof, which in side view seemed to have been copied directly from Crystal Palace.21 (Fig. 3)

Figure 3. Royal Post Office, Amsterdam. Architect Cornelis Outshoorn, 1854. Amsterdam City Archives, 010056918745.

Outshoorn was not active in the Maatschappij tot Bevordering der Bouwkunst, as were De Greef and Godefroy, but he was a member of the Koninklijk Instituut voor Ingenieurs, the Royal Institute of Engineers (KIVI), of which Conrad was the president in 1857. Outshoorn’s constructions for the railways gave him some prestige and the clients of the Palace had sufficient confidence in his reputation to award him the design. After all, what was needed was essentially an engineer capable of constructing a solid building of iron and glass. The fact that Outshoorn, at the suggestion of the directors of the Society, was appointed by the Supervisory Board as architect of the Paleis voor Volksvlijt, is also probably due to his good contacts with one of the directors of the Vereeniging voor Volksvlijt, Salomon Bleekrode. Moreover, Sarphati and Outshoorn likely knew each other from their visit to London in 1851 and Sarphati was aware of Outshoorn’s entry for the London exhibition building.

In order to further explore the forthcoming construction, Outshoorn, who had established himself as an independent architect in 1857, visited the main exhibition buildings in Europe that same year. He was joined by the aforementioned Salomon Bleekrode, but the sources do not reveal much about the trip, only that Outshoorn would become seriously ill. What the nature of the illness was, what cities they visited, what designers and engineers they spoke to, is not documented. But it is known that the two men seem to have spent time mainly in London, where they made a number of agreements, of which nobody should know anything and about which nothing was said at the annual shareholders’ meetings.22
The construction

On 22 April 1858, Sarphati was able to inform the shareholders that there was a complete draft for the new building, which had already been approved by the Supervisory Board. Sarphati had repeatedly urged Outshoorn to design something beautiful. ‘It has to be beautiful, Outshoorn, it has to be beautiful,’ for if the Palace was not beautiful, it would not attract people and fail to meet its goal: to provide space for exhibitions within an educational and stimulating setting. As a result of this assignment, architect Outshoorn, despite his extensive experience with iron structures, did not choose to work with standard elements, as was the case with the Crystal Palace. Instead his design was much more complicated and consisted of many different parts. The specifications for the ironwork alone consisted of more than fifty pages, on which numerous different pieces of cast iron, wrought iron, sheet iron and galvanized iron were listed, all of them different. This meant that few elements could easily be reproduced and so, for almost every iron part incorporated into the building, a new moulding model had to be made. This had a significant impact on the rate of production.

What the shareholders in Amsterdam had not been told was that a London-based engineering firm had been called upon to produce the technical drawings. In January 1860 The Builder and English newspapers reported that the construction details of the ‘Amsterdam Crystal Palace’ had been entrusted to ‘Mr. R.M. Ordish, of Great George-street, Westminster’. Rowland Mason Ordish was a leading engineer who, together with William Henry Le Feuvre, had patented a bridge construction system and had been working on bridges and stations since the 1840s. Ordish joined Fox Henderson, the engineering contractors responsible for the detailed structural analysis and construction of Joseph Paxton’s Crystal Palace. The firm’s factory, known as The London Works, was based in Smethwick near Birmingham. Ordish worked on technical drawings for Crystal Palace, including when the building was later moved to Sydenham Park at the end of the Great Exhibition.

Ordish was one of the leading figures in the design of iron structures, delivering not only innovative work, but also aesthetic improvements to iron architecture. He founded his own engineering firm in 1858 and from then on devoted himself to the design of arches and domes, advising architects and engineers at home and abroad on the detailing of iron structures. He was responsible for some of the most innovative and iconic iron structures of the nineteenth century, frequently working in collaboration with well-known architects. He built bridges and exhibition buildings, winter gardens, market halls and railway stations. Eventually in 1867 he was to take on the design of the dome of the Royal Albert Hall in London. In 1865 he was responsible for the construction of the Winter Garden in Dublin, a large exhibition hall designed by Alfred Jones to overshadow the original 1853 exhibition building in Dublin. Together with architect and art theorist Owen Jones, who had been responsible for the colour scheme at the Crystal Palace, he devoted himself to the export of iron architecture. Oriental-style designs with domes and minarets in iron were delivered from England to Bombay, Cape Town and Rio de Janeiro and he also exported iron prefabricated buildings to Turkey, Singapore, Russia and Georgia. (Fig. 4)

After the municipal council of Amsterdam had finally established the building site for the Palace on 10th August 1858, located partly in the 17th century defensive moat, the specifications for the foundations were made public almost immediately. This was followed on 3rd September by an invitation to allow contractors to tender for the work. Only four days later, on 7th September 1858, the first pile was driven into the ground. (Fig. 5) Some 2,000 piles followed, accompanied by some 2,400 cubic metres of masonry, bluestone, cast and forged iron and the necessary amount of clinker, to pave an area of 6,600 square metres.
Figure 4. The Crystal Palace conservatory, before shipping to Istanbul. Architect Owen Jones and Rowland Ordish, c. 1861. From: Clarke 2016.

Figure 5. Paleis voor Volksvlijt, Amsterdam, foundation works, 1858. Print by Willem Hekking jr. Amsterdam City Archives, 010001000925.
In London, the 564-metre-long Crystal Palace was erected in ten months; in Munich, the construction of the 234-metre-long Glass Palast took only 78 days in 1854. However, in Amsterdam, it took almost eleven months before the first iron parts were brought from the factory to the building site near the river Amstel.\footnote{The first tender, dated 24th March 1859, for the 125 metres long superstructure was unsuccessful. Outshoorn sacrificed some decorations to save money, with the idea that they could be added later. (Fig. 6) A second round of tenders, on 24 May 1859, yielded the desired result: the owners of the Cycloop Ironworks in Amsterdam were prepared to carry out the work for an amount of 616,000 guilders, more than 50,000 guilders less than the highest bidder.} The Supervisory Board was convinced that the whole construction could take place in one year or at least within two years and, somewhat prematurely, it was decided to celebrate the opening of the building in 1861.\footnote{On 13 April 1860, the first column was erected in the presence of the King and the Prince of Orange. The cellar was already ready and contained 108 iron columns, forty of which were hollow and used to drain rainwater. Materials were brought in on a specially constructed iron track which also allowed the scaffolding to be moved along the entire construction site. In February 1860 a storm blew over the scaffolding but Sarphati reported optimistically that he did not think that this would seriously delay the work. Large quantities of iron had been brought in and the work was made easier by the fact that a steam engine had been installed in the middle of the construction site to lift heavy pieces. This steam engine was also needed for drilling and sawing work.} The rather modest Cycloop Ironworks company of Sebastiaan Dudok van Heel and P.H. Holtzman, which had to deliver the iron, was only a few years old. The iron foundry needed some time to model...
and cast the pillars and trusses for the Palace and transport them to the building site, but the company was not able to undertake this work alone. With only 43 workers employed in 1857 and a single 6 hp steam engine, the production of the entire Palace was completely out of their league. Even before the owners had registered for the construction of the Palace, the Cycloop Ironworks had entered into an agreement with the iron manufacturers Smith & Son of Smethwick. Smethwick was also home to other iron manufacturers including the aforementioned factory of Fox, Henderson & Co., suppliers of iron for Crystal Palace. Although Fox had gone bankrupt in 1856 due to financial problems with the construction of a railway line in Denmark, this did not prevent him from continuing to take on projects, and there were also other iron manufacturers operating in Smethwick, such as Smith & Son. Smith & Son, in turn, had outsourced the production of the cast iron columns for the Amsterdam Palace to the firm of Greeves in Hartlepool. Smethwick was also home to Chance Brothers & Co., the company responsible for the supply of the glass for Crystal Palace. It seems likely that the Cycloop Ironwork company knocked on the doors of the manufacturers involved in the construction of the London Crystal Palace in order to erect a similar structure, on a smaller scale, in Amsterdam. Outshoorn and Bleekrode probably paved the way for these contacts during their visit to London.

This English contribution to the construction was not mentioned in De Volksvlijt or the many brochures that were published on the Amsterdam Palace. Those who relied on the information provided in the Netherlands knew only that the design by Outshoorn was fully executed by an Amsterdam contractor. If it became clear that the Palace could not be built without English expertise, this would detract from its Dutch character, explaining why the Vereeniging quietly suggested that the project was a Dutch affair. In July 1860 there was a short note from England to the board of directors that at least one hundred tons of iron would be delivered to Amsterdam over the month. The same note stated that the rest of the order, which was to be ready in December, would follow in monthly portions. This meant that completion in 1861 was not feasible, as the finishing of the building would also take some time, and the Palace Society could have decided to accept the delay and continue the arrangement with the English suppliers of iron. But the columns supplied by Greeves were said to be of poor quality and many component parts were rejected. Calvert & Co. of York then took over the work, but this again was not an improvement. As a result, in 1860 someone from Amsterdam was despatched to the Smith & Son factory to inspect the works. On 3rd December he reported that he had first visited the engineers’ office in London, where he found that ‘enough progress has been made there, so that the work will not be delayed before the moment’. He then travelled to York to visit Calvert’s foundry. He examined the contract between Smith & Son, Cycloop Ironwork’s sub-contractor, and Calvert which included what had been stated in the note from July, namely that one hundred tons of castings would be delivered to Amsterdam in that month and the remaining 1700 tons in the following months, equivalent to 300 tonnes per month, or 75 tonnes per week. The fact that this agreement was not met was blamed on the Smith & Son models. Calvert seemed to have choked on the order. The heavy columns alone required eight days to mould, cast and then removed from the mould, after which time the pieces of iron were often found to have not cooled down sufficiently. The representative from Amsterdam after carefully inspecting the foundry found it one of the largest in existence, with the model room complete with models for the Palace ironwork columns and pedestals, while the external iron frames and fillers were already planed and finished and ready for the foundry.

The rapporteur did not find any gross negligence. In fact three quarters of the factory was reserved for production for Amsterdam and over 120 people were working on the project, so there was not much to be said about capacity either. However, the inspector thought ‘that the factory would not be able to deliver and finish more than a maximum of 50 tonnes per week, and that it would still be able to do so once the
columns of the octagonal side have been cast’. This meant a delay of five months, with production of only two thirds of what had been contractually agreed. But was that a reason to terminate the contract? The rapporteur weighed up the pros and cons and came to the conclusion that termination ‘should be discouraged and, above all, that the time that any other producer would again need to find out about the case would take at least 3 to 4 months’ and even then it remained to be seen whether the foundry that took over the work would actually achieve the desired production capacity. He also considered it unlikely that another producer would be willing to accept a penalty clause especially as Calvert had not done so.

After his visit to York, the rapporteur travelled on to Smith & Son in Birmingham, where the wrought-iron components were manufactured. Here stocks were adequate and he concluded that, in the interests of the work, it was not wise to outsource it to anyone else. According to the rapporteur’s estimation, the ironwork would be ready in May of the year 1861.42

The members of the board of directors in Amsterdam do not seem to have agreed with the advice contained in the report. It was ignored and instead, it seems, that a reason was sought to break off cooperation with the British iron industry. Later, at the opening of the Palace, it was said that the contractors Van Heel and Holtzman had experienced ‘much unpleasantness’, as it transpired that Smith & Son were ‘in financial difficulties’, which made it impossible to meet their obligations. There is no evidence to support this claim. Indeed, Smith & Son continued to trade as a manufacturer of stoves and other iron products until well into the twentieth century.43

Herman Adriaan van den Wall Bake, who in February 1860 became owner of his own iron foundry and commissioner of the Palace Company, had a particular interest in moving production from England to the Netherlands. This was also true for the industrialist Paul van Vlissingen, another member of the supervisory board. The situation in the Dutch metal industry was far from good at this time. Foreign competition was fierce, the shipping industry experienced a slump and abroad there were high import duties. The Dutch government did not take any measures to promote or support the industry and in order to keep their heads above water producers had to tender low prices for projects that would otherwise have been more profitable. Van den Wall Bake and Van Vlissingen were also aware that the dependence on English iron for a building meant to represent Dutch industry was a national humiliation. Part of the iron framework was already in production but if the rest of the building were to be produced in the Netherlands, it would appear as if the palace was truly an example of Dutch inventiveness.44

The Completion

At the sixth general meeting of shareholders on 22 April 1861, it was announced that the main contractors Van Heel and Holtzman, the owners of the Cycloop, had signed contracts with five different Dutch iron founders.45 The ironwork of the main hall was to be done by Paul van Vlissingen and Abraham Dudok van Heel on Oostenburg – although possibly only the trusses were involved.46 The ornamented facades were to be supplied by the company Enthoven & Co from The Hague. The firm of Kruseman & Van den Wall Bake from Utrecht would make the large dome of the building.47 For the Kruseman foundry, this led to a substantial expansion of the workforce by eighty people. D.A. Schretlen & Co. in Leiden had to take care of the eight smaller domes on the side halls. The ‘Prince of Orange’ from The Hague – the foundry of the widow A. Sterkman & Zn – supplied the railings, while the capitals of the columns and other decorations on the building were adopted by zinc foundry L.W. Schütz from Zeist. In this way – in what could be called the first iron conglomerate in the Netherlands – the construction of the prestigious Palace was to become a national showpiece, despite the fact that the basic construction of the building was indeed made in England.
It would take until 9 November 1861 – more than three years after the first pile was driven, and almost nineteen months after the first column was erected – before the first truss of the roof structure was erected. (Fig. 7)

Figure 7. Paleis voor Volksvlijt, Amsterdam. Architect Cornelis Outshoorn. Steel frame during erection, 1862. Unknown photographer. Amsterdam City Archives, OSIM00008004021.

Figure 8. Paleis voor Volksvlijt, Amsterdam. Architect Cornelis Outshoorn. Building nearing completion, April 1863. Photo published by A. Jager. Amsterdam City Archives, 010007000739.
The delivery of the ornamented facades by the company Enthoven & Co from The Hague went without any noteworthy problems. The same applies to the eight small domes and the balustrades. While the main construction was not yet finished, the finishing of the side rooms could already begin. On 13 October 1862 the construction of the small domes began. In April 1863, completion was finally in sight. (Fig. 8) But there was no major opening exhibition planned, so there was no hard deadline to be met. As a result, there was no urgency to achieve an opening date, which, in comparison to the will of the builders to complete the project, resulted in a strange resignation on the part of all those involved. In addition, extra money was needed to cover the costs that had not been taken into account at the outset.48

On 3 September 1863, the huge Victory statue was placed on the dome, an angel with an illuminated torch, a statue of zinc. The design was made by the Belgian sculptor Jean-Joseph Jacquet, while the firm L.W. Schütz from Zeist did the casting.49 Schütz was also responsible for the zinc capitals around the cast iron columns and other ornamental elements to the building. Written sources do not reveal to what extent Rowland Ordish was still involved in the construction. But a stone’s throw from where in 1863 the dome of Van den Wall Bake was placed, Ordish in the same summer supplied the roof of the Rijnspoorstation at the Weesperstraat (Fig. 9), part of the Rijnspoor, to which Van den Wall Bake had also been connected. Ordish made the design, the first application of sickle rafters in the Netherlands. An English company produced the parts, which were then assembled by English employees of that company in Amsterdam.50

Figure 9. Rijnspoorstation, Amsterdam. Architect Rowland Ordish. Building after completion. Photo: Jacob Olie, May 1902. Amsterdam City Archives, 010019001453.
Shortly afterwards, the glass could be placed on the Palace. 6200 square meters of glass had to make the building wind- and waterproof. The main hall of the Palace was fitted with a glass roof to allow daylight to enter optimally. The parallel rooms on the sides had closed hoods, but also those had large glass facades. Frosted glass was to be used for the main hall and four side rooms. It was double glazing, to ‘prevent the dripping of moisture’. The windows on the sides, which were made of cast iron, were fitted with single, frosted and ribbed glass. Samples had been examined beforehand to ensure that the glass was pure white and free of air bubbles and unevenness. The windows were placed on the curved roof in a tile-like manner. There were flattened glass rods on which the windows could be supported. At the point where the windows overlapped, putty had to be applied on the inside and outside to ensure that the roof was watertight.

The Palace was more than 125 metres long, 68 metres wide and 57 metres high. (Fig. 10) Anyone entering the building from Frederiksplein came into a large, square vestibule with columns. Through the large rose window in the gable above the entrance, light fell in, and on both sides of the entrance hall there were spacious stairwells. Exhibition halls could be found both to the left and to the right of the hallway. The cathedral-like exhibition hall with side aisles and galleries lay behind it. In the middle the oval dome rose up, while the hall itself was covered with glass and at the ends again half rose windows were placed. Behind the main hall were again smaller exhibition halls and people could eat and drink in one of the ‘refreshment halls’.

On 16 August 1864, some seven or eight thousand people gathered in the main hall of the Palace, where stands had been set up for the occasion and flags had been hung. (Fig. 11) Thousands of other curious people had gathered outside the building. Sarphati praised the architect Cornelis Outshoorn and the contractors. He recalled the problems that had arisen during the production of the iron in England and the way in which Dutch manufacturers – by joining forces – had overcome these difficulties.
Figure 11. Paleis voor Volksvlijt, Amsterdam. Building during opening ceremony, 16 August 1864. Amsterdamsche Courant. Amsterdam City Archives, 010094005746.
Some visitors complained about the acoustics of the hall, but shortly after the opening everyone was full of praise. The construction of the Palace was presented as an example of courage, enterprise and perseverance. Journalists all over the country were drawn to superlatives. It was as if everyone was cheering, but only the organizers themselves were somewhat paralysed by years of effort. In the room to the left of the main entrance were works of art by Dutch masters, from the possession of the city of Amsterdam. In the other rooms works of art were to be admired and a small exhibition of industrial products, though no innovative examples of technology. No major international industrial exhibition had been organised that would have enabled Holland to present itself to the world. The opening was not used to present an unforgettable spectacle of trade and industry and to show what innovation and entrepreneurial spirit were capable of. As a result, the great and long-awaited moment of the opening remained untapped and was only used for the greater honour and glory of the building itself.

**Criticism**

The opening of the Palace was accompanied by a well-orchestrated PR campaign initiated by Sarphati, in which the Palace was highly praised in Dutch, French, German and English as a ‘masterpiece of architecture’, and a ‘paragon of beauty, taste and majesty’. According to P.H. Witkamp, who had been commissioned by Sarphati in 1864, the genius of Cornelis Outshoorn should not be overlooked, and the positioning of the windows, pillars and towers were all highly praised. Witkamp continued his panegyric to the Amsterdam Palace by declaring that none of the industrial palaces in London and Paris, Munich and Dublin, Manchester and New York combined such great architectural beauties with such an excellent, efficient layout and indeed no one else had designed such ‘noble forms’.

This PR was effective in making it look as if the Palace had been built without any technical know-how from England. But it is clear that it would have been impossible to construct the building on the basis of Outshoorn’s drawings. Construction required much more detailed drawings, but instead of admitting this and giving Ordish the credit he deserved, the prestigious project was presented as a purely national, Dutch affair. Outshoorn was placed on a pedestal and presented as a brilliant all-rounder in an attempt to put Dutch industry in a better light and present Outshoorn as the Dutch Joseph Paxton. (Fig. 12) In reality his designs served only as the basis for the English constructors’ technical drawings, which severely detracted from the claims of Outshoorn’s sole authorship.

Moreover, the English contribution did not help Outshoorn in the eyes of his later critics. After initial praise, critical voices began to emerge, describing the galleries as too high, the stairs not well positioned, movement in the floors, draughty entrances and much more. For almost two million guilders Amsterdam had ‘a colossal iron building, without character, with walls, windows and roof shields that are blind, with side and other doors that are not used, with a very plain lower level [and] a much too showy and embellished upper part [...]’. According to one critic, iron, glass and zinc were inefficient building materials. The Palace was already rusting. The dome, the miniature transoms and towers testified to this even though they could only be reached via dangerous steep ladders. The writer, ‘L.B.’, was annoyed by the aimless decorations, which were not accessible and, according to him, spoiled the monumental character of the building. He also noted that a second glass roof had been installed in the Palace, because the first appeared to be leaking, but what really struck him was the praise that architect Outshoorn had received. Instead of making an original design, ‘L.B.’ accused Outshoorn of utilising the earlier entries in the 1857 competition and shamelessly taking advantage of them. According to ‘L.B.’, the entry ‘Kohinoor’, designed by A.J. Sevenhuijsen (see Fig. 2), in particular had served as a blueprint for Outshoorn’s final design.
It was architect J.H. Leliman, secretary of the Maatschappij tot Bevordering der Bouwkunst and in 1856 one of the shareholders of the Palace company, who in January 1867 eventually came up with a comprehensive and thorough critique of the building. He discussed the entire construction process, the specification and the building itself. The construction and operation had been presented as too rosy, he judged, and too little account had been taken of disappointing revenues. And now, just over two years
after the opening of the Palace, the Society was in dire straits. The Company was, as Leliman described it, buried under its debts with the actual revenue only equivalent to its outgoings. Whereas in 1856 an annual yield of four hundred thousand guilders had been predicted, in reality that amount turned out to be only one hundred and fifty thousand. The dazzling promises made to the shareholders ten years earlier were not fulfilled. Leliman also was critical of the decisions leading up to and the actual procedures surrounding the design competition for the building. According to him, it would have made more sense if the competition had specified a building in stone, given its desired monumental character. How was it possible, Leliman wondered, that Outshoorn had been commissioned to make the final design? And how could it be explained that the final design had all the characteristics of Sevenhuijsen’s original plan?57

Leliman provided no explanations for these questions and left it to the readers to draw their own conclusions. Although Leliman considered Outshoorn to be a skilful builder, he found it incomprehensible that someone who initially had designed a stone building had converted it to iron after visiting a number of exhibition halls abroad. The resulting building compelled Leliman to express his grievances at length: the Palace was too fragile, the iron, seen from a distance, was too insignificant. As a result, in Leliman’s eyes it was not harmonious and could not stand the test of criticism. The building was an ‘artificial weave’ or a product of industrial thinking and had nothing to do with the aesthetics of beauty in architecture. According to Leliman, iron was not suitable for the construction of a monumental building, while averring that he was not conservative in his taste and was even in favour of combining all kinds of architectural styles in one building. He did allow that the dimensions and the practical composition of the whole structure were quite credible, however, he found the building full of defects. The original entrance hall, which was designed to prepare the visitor for the large exhibition hall, had been left out. The doors were too narrow, the dormer windows superfluous, and the facades crowning the side rooms were empty decorations. The oval dome was out of proportion and moreover too expensive. Leliman referred back to the construction of the Crystal Palace, which had consisted of many thousands of identical parts, which could be combined and repeated endlessly. This system had been adopted in other iron exhibition buildings all over the world with great success. The exception was Outshoorn’s design in Amsterdam. Outshoorn had endeavoured to make every individual part unique resulting in an abundance of decorations and much higher costs.58

Leliman was also concerned about fire safety. In Antwerp, the dome of the stock exchange, modelled on Paxton’s Crystal Palace, had collapsed due to a gas leak that caused an explosion and the rebuilt Crystal Palace, at Sydenham, suffered a terrible fire which destroyed part of the building. Although the Palace in Amsterdam consisted for the most part of iron and glass, there was still a great deal of timber used in the finishings which was a fire risk. Leliman did acknowledge that Outshoorn had taken on a thankless task requiring much patience with regard to the wishes of his clients. In the end he had built something that was unparalleled in the Netherlands, even though ‘a little help from abroad’ was called in. Leliman did not mention any names and subsequently no one else returned to the alleged plagiarism of Cornelis Outshoorn. Leliman, diplomatically, merely expressed the hope that Outshoorn would himself speak openly about his efforts in building the Palace. However Outshoorn, at least in writing, never did.59

Conclusion

In the sixty-five years that the Palace existed, it is estimated that some 23,725 exhibitions, concerts, theatre performances, operas, political meetings, balloon rides and other events took place. But its functioning remained an ongoing drama. In order to attract extra capital, the board decided in 1881 to sell more than one third of the palace garden at the rear for over half a million guilders. The land was developed by a Galerij-Maatschappij (Gallery Society) set up to build a shopping mall, designed by the architect A.L. van Gendt.60
Figure 13. Paleis voor Volksvlijt, Amsterdam. The Palace shortly after the fire, April 1929. Amsterdam City Archives, BMAB00012000034_007.

Figure 14. Paleis voor Volksvlijt, Amsterdam. Situation after the fire on 18 April 1929. Amsterdam City Archives, OSIM00001003423.
On the night of 17th April 1929, around a quarter to three, a watchman saw smoke coming out of the right wing where the Palace café was located. The fire spread quickly. The theatre was a sea of fire and the flames were so violent that shortly after three o’clock it was clear that the palace was lost. A strong south-westerly wind further fuelled the flames. The glass in the casings burst and melted, and the flames spread metres high above the palace. The iron melted and the building collapsed piece by piece. The roof of the café and the auditorium came down: twisted and bent rafters fell around four o’clock, announced by a dull rumbling, and the dome with the Victory statue atop collapsed. Oxygen cylinders inside the building exploded and the debris ended up on the street hundreds of metres away. Finally, the side walls at Westeinde collapsed. The fire was eventually extinguished on Sunday 21 April, at 13.00 hours. (Fig. 13, Fig. 14) The next day the fire brigade demolished the remaining unstable parts of the building using crane trucks.

The fire marked the end of the Paleis voor Volksvlijt. The thousands who came to see the ruins in the days after the fire mourned the loss of the building. ‘An original piece of Amsterdam was eaten away by the flames from us tonight,’ wrote Het Volk on 18 April 1929. And an anonymous writer in the Monthly Amsterdam wrote: ‘[…] the Paleis voor Volksvlijt was and remained a property of Amsterdam, which had grown alongside its history […]’. The difficult construction, the alleged plagiarism of architect Outshoorn and the fact that the building could not have been built without English know-how were long forgotten. The lost Paleis voor Volksvlijt would remain a symbol of innovative construction and architecture realised through Dutch industry and design.

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Notes and References

1. The author would like to thank Bill Addis, Natasja Hogen, Erik Schmitz, Ronald Stenvert and Robert Thorne for their help and suggestions.
3. B.S. Kapsenberg, Uit ijzer gegoten. Beeld van de Deventer ijzergieterij Nering Bögel en haar

4. J.A. Groen, Een cent per emmer. Het Amsterdamse drinkwater door de eeuwen heen, Amsterdam s.a., 66-67 and 73.


Amsterdam’s Crystal Palace – a forgotten example of British engineering (1858-1864)

Tijdschrift voor Nijverheid, Landbouw, Handel en Scheepvaart 1 (1855), 420.


18. Cf. Wennekes 1999, 49-50 and 54; Sarphati 1855, 386.


32. Sarphati 1860, 79; Witkamp 1864, 19.


39. Amsterdam City Archives: klein materiaal (toegangsnummer 15009), inv.nr. 13197 (oud: 727.003).


41. Amsterdam City Archives: klein materiaal (toegangsnummer 15009), inv.nr. 13197 (oud: 727.003).

42. Amsterdam City Archives: klein materiaal (toegangsnummer 15009), inv.nr. 13197 (oud: 727.003).

43. Witkamp 1864, 20; https://www.gracesguide.co.uk/Samuel_Smith_and_Sons [6 maart 2019].

44. According to the general terms and conditions attached to the specifications of the work, the Palais Society could have the work carried out by others if it did not make sufficient progress or if the supply of material was delayed. Paleis voor Volksvlijt, *Algemeene voorwaarden*, Amsterdam 1857, 7.


52. Witkamp 1864, 32; Stokroos 1994, 55-56.


55. Witkamp 1864, 28.

56. L.B. 1866, 75.

57. Leliman 1867, 6, 10.


