Foreign Iron in Venezuelan Architecture: Modern Building Technologies at the End of the Nineteenth Century

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There was no industrialized iron production in Venezuela until the middle of the twentieth century. Until then, there was only massive extraction for processing overseas. But with the commission of the first buildings made of cast iron starts an appropriation process of modern materials and technologies in the hands of Venezuelan builders. This process begins in the year 1874 and acquires great importance during World War I, when iron, but especially its transportation by sea, became really expensive. For each construction experience during the years subject of our study (1874-1935), architects and engineers, became qualified through experiences in Venezuela, and required less instruction from overseas, even when they continued working with imported materials and building technologies.

SELECTIONS IN CATALOGUES: A MODERN INVENTION

During the nineteenth century, steam machinery and changes in production procedures were related to the benefits in everyday life in cities. Steam machinery made possible mass production of items. With the automation of printing processes, even the daily press became an industrial product. Thus, we had the emergence of illustrated catalogues which offered British industrial products to overseas markets.

With the appearance of the cast iron age and the corresponding catalogues of related products, we observed a modern invention in the marketing of industrial products for their export overseas. With such catalogues, trade was taking the first steps toward globalization. Such an age, became the golden age of catalogues as defined by François Chaslin between 1840 and 1880, starting at the same time in France and England (2004, p. 54). With this new type of trade, buildings and architectural elements of different companies started to live together all over the world.

Fabrication, transport and assembly became totally different processes, often occurring in different places and times. Those modern construction procedures had an important incidence during the middle of the nineteenth century Latin American architecture, because it was common to import industrialized street furniture, ornamental accessories, structures and metallic components for architecture or territorial equipment. Even when there was industrialized cast iron and steel in Latin America, it was a rather limited production in comparison with the large scale production in Europe.

Versatility of cast iron made possible an enormous choice of manufacturers of all kinds of construction elements and urban furniture for the modernization of public spaces. With new city squares, parks and boulevards, there was a new modern way of life in those cities which incorporated urban spaces for leisure time. For those public spaces there were imported cast iron benches and lanterns, cast iron fountains and balustrades, kiosks and the newly acquired habit of taking walks on Sundays.

Those iron works produced examples in Venezuelan cities given that President Antonio Guzmán Blanco (1829-1899) started his political career as the man who modernized the country. Among his first public works was the *Plaza Bolívar* and its commission for fences and four water fountains from the French firm Val D'Osne in 1872. Four years later, the Square suffered its first modification, with new equipment from the catalogue of J.L.Mott Iron Works of New York.

This urban furniture option was shared with other cities around the country and world which included iron fences around Valencia's *Plaza Guzmán Blanco* and *Plaza Candelaria*, as well as those bought for the *Plaza Bolívar* in that city, all of them imported from England. In 1874, the *Plaza Guzmán Blanco* was completed in Caracas; it seemed more like a boulevard with iron fences around the President's statue. In 1880, the *Parque Carabobo* had "360 meters of iron balustrades with lights posts". Similar components were imported for the *Plaza Candelaria*'s fixtures from *Mott* of New York and from the British firm of *W.T. Allen* for the *Alameda de Santa Teresa* (Zawisza 1988, vol. 3, pp. 172-4). Squares and parks acquired an air of luxury with all these furnishings; even a private house, that of President Joaquin Crespo's *Villa Santa Inés*, was referred to as a *palais* in the Edward Puls 1892s catalogue from Berlin, thanks to the exquisite fence around its garden. That became the road for the modernization of new public buildings such as the Theatre and the Capitol.

In a middle point, between functional and monumental, between sanitary and representative urban reforms, there were cemeteries, another public space where foreign iron fixtures played an important role. An outstanding example of this can be seen in Valencia's Cemetery where fountains from J. Fiske, from New York are evident. The usefulness of the necropolis and its romantic historic character had a competition in all nineteenth century cemeteries. Maybe to contribute in this perception were the iron fences around some memorials, imported from Walter MacFarlane and Co. of Glasgow. Maybe the commissioners for those fences were the same who imported the iron works for Valencia's Theatre and squares, all of them selected from catalogues.

Fences, benches, street and square lights arrived in five continents. The cast iron age was, therefore, an international aesthetic era. We can observe the same model of iron light posts in the Caracas *Plaza Bolívar* or the *Plaza Candelaria* with those of the *Teatro Juarez* of Guanajuato (Mexico). The same occurred with Maracay's *Plaza Bolívar* posts with some of Mexico City's important architecture from *Florence's Fonderia del Pignone*, and the same models of fences seen in

Valencia's Cemetery and the fence around Guanajuato's theatre. Thus, whether it was for festive or monumental applications, the modern invention of catalogues would serve the purpose of informing the customers of the possibilities with which they could determine the customized applications of fixtures seen in the engravings reproduced in printed form. Time would show how this modern instrument would become the starting point of commissions of complex structures which would later become bridges, buildings and all kinds of architectural components.

FIRST VENTURES: CAST IRON IN URBAN MODERNIZATION SCHEMES

The *Puente de Hierro* (Iron Bridge) in the Southern sector of Caracas, became the first one to cross the Guaire River along the city valley; it was finished in 1875. It was related to and contemporary with the first two monumental buildings with metallic structures commissioned from England by the new Ministry of Public Works of Venezuela (MOP), founded in 1874 by President Guzmán Blanco.

Those two buildings were the *Palacio Federal Legislativo* (Federal Legislative Palace), known at that time simply as *El Capitolio* (The Capitol), and the *Teatro Guzmán Blanco*, today *Teatro Municipal*. Those British iron structures in Caracas were a decisive introduction of modern building materials and technologies into Venezuelan architecture. Its first modern light house, built at the same time on the *Archipiélago de Los Roques* on the Caribbean, and the columns that supported the *Mercado de Valencia* (Valencia's Market Hall) built in 1845 by Alberto Lutowsky were imported from Great Britain. But there are no precise details about them.

Figure 1. *Puente de Hierro*, Caracas. Luciano Urdaneta and Henry Cook, 1874-1875 (*Memoria MOP 1876*).

The English engineer Henry J. Cook thus accompanied the Venezuelan Luciano Urdaneta (1825-1899) in the construction of the Iron Bridge over the Guaire River. He guided the Venezuelan engineer in the venture of building a modern structure overseas. The *Puente de Hierro* became a local icon of modernization and a permanent reference of such (today the place is still called *Puente de Hierro* even though the bridge is no longer there).

The cast iron structures that were part of the different stages for the National Capitol are the most important image components of the assembly of the two buildings. The first group of iron components was imported in 1874, providing sophisticated historical finishing forms to the *Palacio Federal Legislativo,* a much better option than those possible with local materials and artisans. The iron works for that stage of the Palace during Guzmán Blanco's tenure, included columns, beams, components for floors, handrails, fences and ornamental pieces for the building and the gardens.

Figure 2. *Palacio Legislativo*, Caracas (Hernández 1997, p. 101).

As the *Memoria del Ministerio de Obras Públicas* in 1876 says, the iron works for the *Palacio Federal Legislativo* were a contract with The Crumlin Works & Co. Ltd., the same manufacturer of the Iron Bridge. The firm, represented in Caracas by the aforementioned Henry J. Cook and the local trade firm of *A. Duvall y Ca.* was committed to:

> [...] the manufacturing, transporting and building, at its responsibility and risk, of all the ironworks, including the floors and ceilings of iron and concrete laid down in the drawings, budgets and specifications, […] made by Luciano Urdaneta, the Republic's Consulting Engineer.
>
> (*Memoria MOP 1876*, pp. 22-3).

The long list of prefabricated components indicates that the *Palacio Legislativo*'s improvement was almost totally constituted by iron works. The original walls, built of masonry, remained only as the core for the new building.

In 1876, the *Palacio Federal* was built to the north of the aforementioned building. Again, the commissioning of iron components was given to A. Duvall y Cia., a well-known local representative for The Crumlin Viaduct Works. The new components were almost identical to those imported for the first building. Like them, Staffordshire iron was the English quality assurance element for future commissions from Venezuela in years to come. Therefore, the array formed by the two buildings results in an assembly of cast iron works. The character of its finishings was the most appropriate for the most significant building in Venezuela during the nineteenth century and its builders knew it. To the cast iron bridge, an utilitarian piece in the capital's city southern suburb, was added a building complex destined to show foreign visitors and Venezuelan citizens alike, a democratic stability attained after years of wars and political struggles.

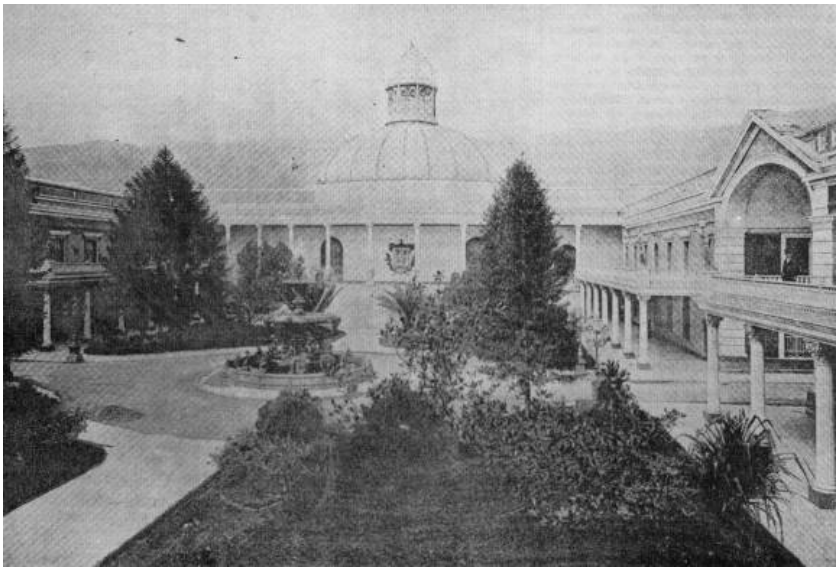

Figure 3. Palacio Federal, Caracas (*El Cojo Ilustrado N° 108*. Caracas, 15 June 1896, p. 489).

Another representative piece of Caracas at that time was the theatre, then known as the *Teatro Guzmán Blanco*, in recognition of the President's efforts at modernizing Venezuela. For the first time, a modern theatrical structure was introduced and the trusses and columns to cover the stage and auditorium furthered the Venezuelan exploration of the possibilities that iron offered to architecture during the nineteenth century. Besides these structural ventures, there were handrails, stairs, columns and other pieces that remained in public view, showing similar finishings with similar purposes like those of the cast iron works in the Capitol.

After technical and political difficulties, the Caracas theatre was built with some changes in the original project. But the commission was based on Architect Esteban Ricard's proposal and on the measurements he made for each piece. His technical drawings are among the few that include details for this Venezuelan public works period. The joints between columns and trusses, elements for the roofs, with no precise technical specifications are a vivid proof that engineers working in Venezuela at that time only provided metallic structure generalities, expecting whichever construction details from the overseas manufacturers.

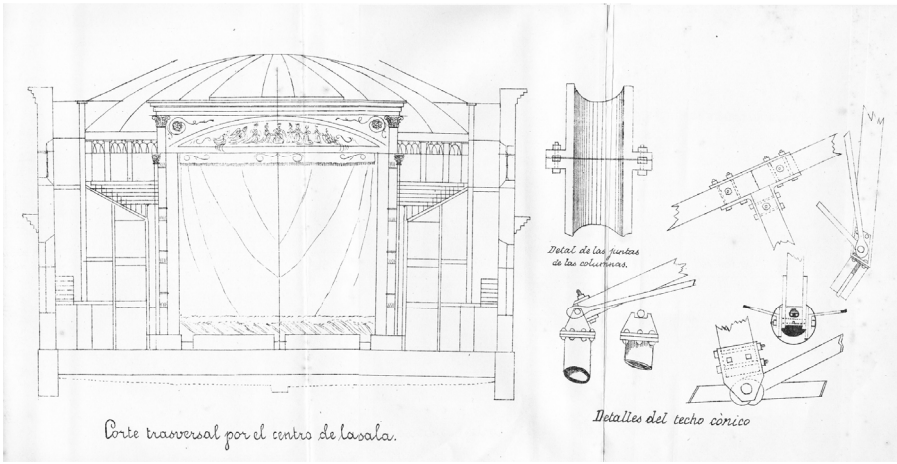

Figure 4. Teatro Municipal, Caracas. Esteban Ricard, 1875 (*Memoria MOP 1877*).

Those details were new considerations for the builders who had to confront a repertoire of unknown elements. That is the reason why it was so important that at least the lantern on the conic roof was "assembled prior to delivery" as the commission contract said (*Memoria MOP 1877*, pp. 49-51). This consideration appears again on the commission for the Valencia's Theatre and the cupola for the *Salón Elíptico* (Elliptic Hall) at the *Palacio Federal*, the last element which was added to it. Both were in the hands of Antonio Malaussena (1853-1919), a French architect who travelled to Europe in 1890 to buy them. It is possible that he purchased them in England given that some drawings have indications in English. On all these commissions it was specified that most of the pieces would have to come to Venezuela as fully assembled as possible, especially the lanterns.

With these and many more experiences, the history of metal structures in Venezuela was written and it was evident how during these first ventures with cast iron and steel, the local engineers needed a serious immersion with the overseas engineers to dominate the techniques.

First bridges and railways: engineering joint ventures

With bridges, trusses or suspended structures, Venezuela visibly approached and assimilated the modern advantages of importing and assembling metallic structures, given the possibilities of

standardizing elements and the fact that some structures could be later moved to other places. From the onset, those first ventures with cast iron architecture and construction, there was a group of Venezuelan engineers working hand in hand with the foreign specialists. The quickest and greatest successes became evident with the railways and bridges joint ventures.

The job of the team of engineers in the railways and thereafter that of the MOP's Bridges Division, turned this office into a real laboratory for the majority of the graduates in Venezuela. One observes an enormous difference between the procedures followed for the building of the first bridges toward the end of the nineteenth century and the expertise with which the professionals worked at the inception of the twentieth century. Whether with small or large structures, they progressed in technical mastery of design, calculation and assembly aspects, as well as in the configuration of new structures with parts from different origins.

A few railways

Brief accounts were made of the first Venezuelan railways between 1883 and 1892. The first date given was the inauguration of the Caracas - La Guaira Railway, in charge of the La Guaira and Caracas Railway Company Limited. The second date was the opening to the *Gran Ferrocarril de Venezuela* (Great Venezuelan Railway) built by *Grosse Venezuela Eisenban Gesellchaft* and better known as the German Railway. With them, the Valencia - Puerto Cabello Railroad and the *Ferrocarril Central de Venezuela* were the four railroads with the most important metal structures integrated on the route. Three of them were made with British parts.

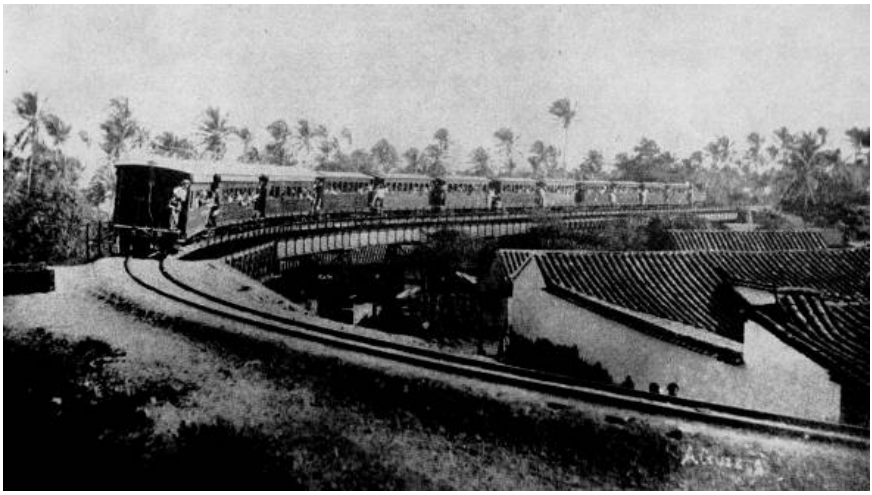

Figure 5. Pariata Bridge, Caracas-La Guaira Railway, 1886. Photo, c. 1915 (Arcila 1961, vol. 2, p. 170).

The Caracas – La Guaira route was the first Venezuelan engineering committment. It represented a true transport revolution for the country, not only because of the reduction in time to go from one

place to another, but because of the amazing structures needed to cross the abrupt topography. The team of railway engineers involved improved the route and carried out all the necessary works for a complicated territory on which every mountain was a challenge on a route going from 3 to 912 m above sea level. Such were the improvements looking for a reduction of the costs. The 400 bridges initially contemplated in the English project were reduced to only one viaduct in Pariata and eight more iron bridges along the road.

From his first report to the MOP, Jesús Muñoz Tébar (1847-1909), chief engineer of the railway, stressed the urgency of commissioning the structures and locomotives from England. The engineer's report included an important suggestion:

> I think it necessary to advise the same company commissioned with those works, of the convenience of bringing with them at least two workmen from the ironworks sector to assemble them and to bring the necessary tools and spare parts for those important parts that break or damage easily and which are impossible to manufacture in the country.
>
> (*Memoria MOP 1882*, p. 329)

This request had a quick response from London, where representatives of *La Guaira and Caracas Railway Company* would find the described bridges and commissioned their fabrication and ship them to Venezuela as soon as it was possible. That same year, chief Muñoz Tébar reports the reception of "the first rails loading commissioned from Europe" with ceramic pipes, nails, scrubs and nuts, four hoists and even bricks (*Memoria MOP 1882*, p. 330).

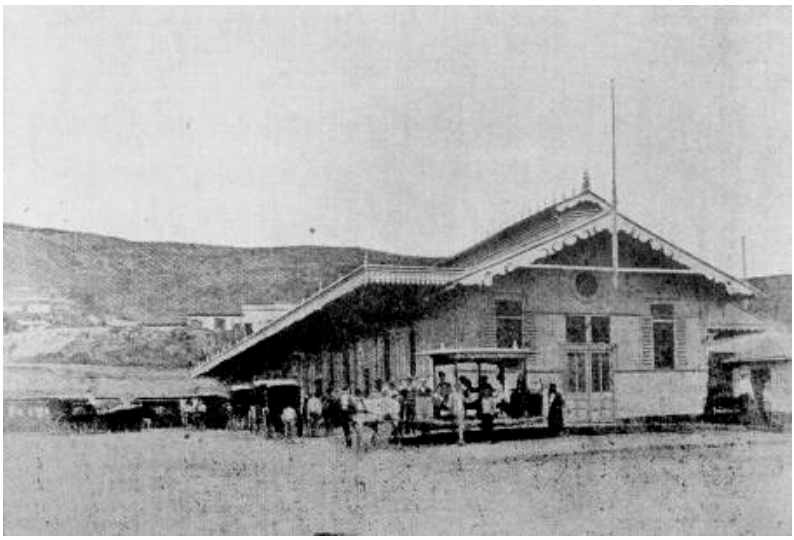

Figure 6. Caracas Station, Caracas-La Guaira Railway, 1883 (*El Cojo Ilustrado* N° 11. Caracas, 1 June 1892, p. 175).

Those capable and enthusiastic engineers, made national progress possible with their arduous hard work, when they could only count on just basic tools and equipment. Extreme difficulties, unstable terrains, and torrential tropical rains during most of the year, were serious menaces to finishing the structures. They stayed on stoically in their work asking repeatedly for the structures and the set of trains that were to come from overseas.

The Pariata Bridge, one of those commissioned, was initially built with wood and substituted with a metal structure built in England under the resident engineer in London (*Memoria MOP 1887*, p. 62). Venezuela's engineers had the task of checking the pieces and of participating in the assembly works. They inaugurated an important railway and started a long list of professional iron builders, human assets for Venezuela. Some of them participated in the connection from Valencia to Puerto Cabello. Just like the trusses for the bridges, the buildings for passengers or warehouses came from English foundries. (*Memoria MOP 1883*, p. 372-3).

The same occurred with stations between Valencia and Puerto Cabello. The roof over railway station platform in Valencia is supported by cast iron columns with marks of the manufacturer in Bristol. The beams on the biggest buildings, like the warehouses and the service station, have a relief of the name of the steel mill Stocktonmi C°.

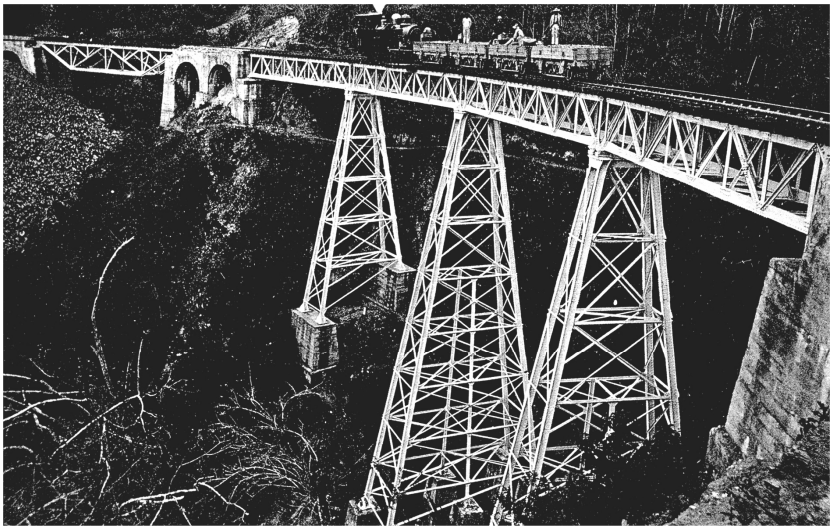

Figure 7. Viaduct from *Gran Ferrocarril de Venezuela*, 1890-1893 (Hernández 1997, p. 64).

Based on his experience with the Caracas – La Guaira Railway, Muñoz Tébar wrote his '*Cartera del ingeniero empleado en la construcción de ferrocarriles en terrenos montañosos'*, published in 1887. It reflected the attempts to integrate the Venezuelan complex geography, with the amazing works involved, especially the viaducts, all of which constitute places with modern buildings

technologies in the middle of forests and mountains. Those were tropical ventures with foreign iron elements described in the *Colegio de Ingenieros* meetings, a true forum where the goals and technical inventions of Venezuela were discussed. The early twentieth century was full of specialized notices and publications about metal structures by both national and foreign authors.

A few urban bridges

In 1891 Caracas had 40 bridges over the Guaire River and the brooks around the city. Some of them show us enthusiastic engineers working over the wild tropical rivers. Some of them show MOP buying bridges without a specific location assigned to them. Contractors for buttresses and base structures for the anchoring of bridges constituted the origin of some engineers' public or private careers. Building became a modern work that necessarily had to be constantly updated and made experts on city and territorial modernization.

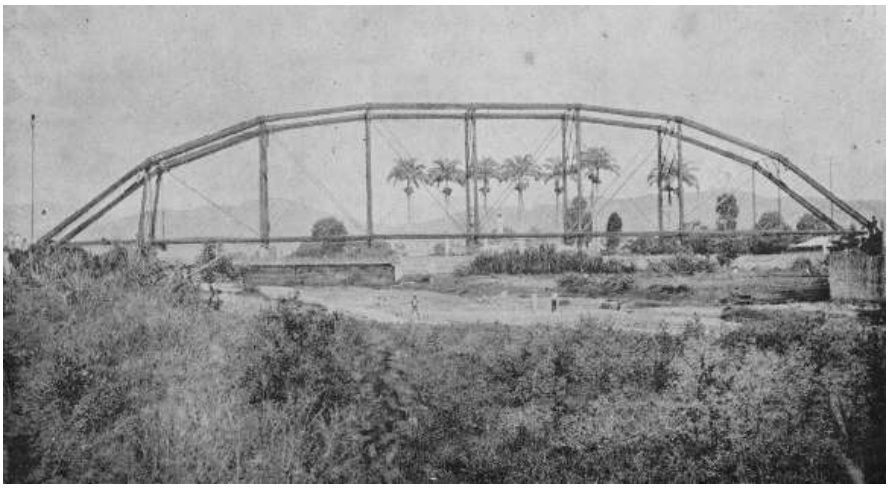

Figure 8. Sucre Bridge, Caracas (*El Cojo Ilustrado N° 89*. Caracas, 1 September 1895, p. 553).

A Neighbour of the *Puente de Hierro* over the Guaire River, the *Puente Sucre* was built with an upper truss started in 1894 under the engineer José Ortega Martínez (-1945):

> [...] a dynamic young man and lover of his profession, he deployed this work using his intellectual resources and a true logistic of well combined mechanical procedures, where the bridge suddenly appeared one day, totally mounted on the heavy sided masonry bases."
>
> (*Memoria MOP 1896*, p. XXVI)

As a juggler, the engineer prepares his performance and *¡voilà!*: he supplies the city with the new structure that contributes to improving the urban routing system. A contract between the MOP and

Manuel Felipe Herrera Tovar (1865-1932) was based on his plans and his budget to assemble a structure imported from France according to the New Societies of *Establishments at Decauville Aine*. During the following year "the bridge was rolled, from the place where it was assembled to rest solidly on its bases" (*Memoria MOP 1898*, p. XX). Upon its conclusion, technical procedures for the new stride over the river were outlined as an added value to its usefulness or aesthetic qualities.

That is how the *Puente Dolores* was assembled and became a spectacular vision for the Caracas citizens as seen in the photographs reproduced in the magazine *El Cojo Ilustrado* (*N° 147*, 1 February 1898, p. 129). One felt an Eiffel echo, whose viaducts and tower were methodically recorded in photos and shown to us today; archiving historically the challenge confronted by such nineteenth century engineers, for whom it was not only a question of designing and calculating enormous structures, but also of establishing the assembly logistics, that would lead to the completion of their projects.

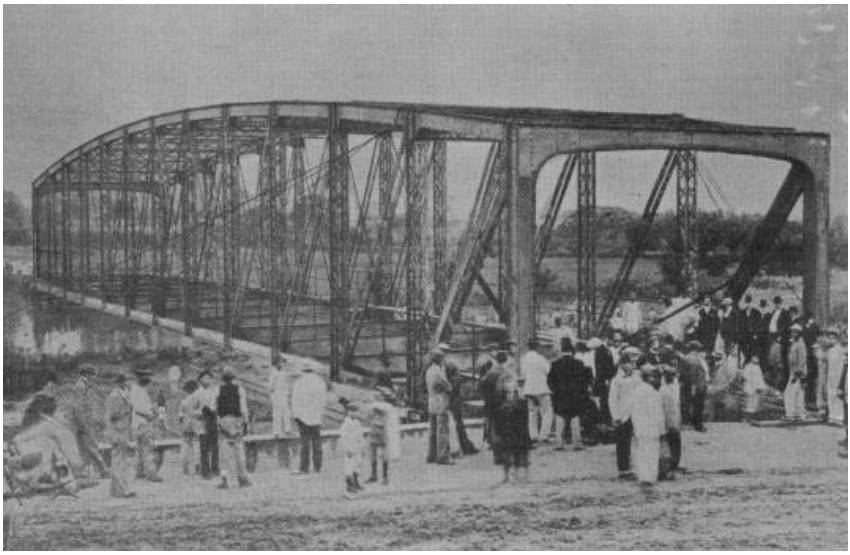

Figure 9. Dolores Bridge, Caracas (*El Cojo Ilustrado N° 147*. Caracas, 1 February 1898, p. 113).

Different from any other kind of structures previously used in Venezuela, there were clear reasons which justified the use of metal structures for bridges, even when it meant spending extra money on the works or when there were few engineers available to assume their upkeep. It was still years after the work of Venezuelan engineers like Ortega Martínez and Herrera Tovar, that the *Puente del Guanábano* (Guanábano Bridge) was built over the Catuche brook. The English structure was commissioned according to the project made by Phillip A. Fraser, then resident engineer in London of the La Guaira and Caracas Railway Company Limited.

In Fraser's report about the bridge, he refers to it as "a new viaduct made of iron, light as a structure, cheap and durable, and able to withstand possible earthquakes; one that could be assembled and finished within a very short time frame." (*Memoria MOP 1885*, p. 92). The engineer describes his plans for the bridge and gives recommendations about its assembly. Those were times of successes and some mistakes in the commissions, transportation and assembly of different structural systems, which furthermore constituted a learning experience for that still-incipient engineer corps when working with iron and steel. They confronted new technical requirements and standards which questioned, not only the few urban bridges described above, but also the many others that were built throughout Venezuelan territory. Those were part of the ventures originated by modern materials and building technologies in a country with an architecture that had traditionally based its structures on bearing walls.

The twentieth century begins with the improvisation of some bridges using surplus pieces existing in the Public Works Ministry's inventories, especially during the war of 1914 - 18. The war was the cause of a healthy building improvisation that resulted in a technical asset to the country. When commissioning foreign structures for the National Roads System, the engineers determined the specifications for the upper trusses and suspended bridges. Thus, Luis Vélez (1858-1935), became a Venezuelan engineer who worked on a system to build such suspended bridges with local materials. His system was published in specialized magazines and received favorable technical reviews from both foreign and national engineers.

However, there were still structures commissioned from abroad: in 1922, there was the building of a bridge over the Guaire River using materials from United States Steel. In 1930, two bridges were assembled in the northern part of the country with materials from the Belgian *Societé Anonyme des Ateliers de Construction de Hal*. In 1932, there was another one using materials from Krupp A.G. Friedrich-Alfred Hütte Rheinhause in Germany, the same manufacturer that built the German Railroad in 1890. In all such ventures, Venezuelan engineers prepared the buttresses and all the corresponding works. That was the way that in the 1930s, the assembly of bridges became a well-oiled procedure under the aegis of the MOP's builders.

The architecture of engineers in Venezuela

As previously stated, significant buildings erected by engineers were the Capitol and the Theatre, both made in 1874. They constituted the first examples of the long list with iron structures or cladding. As in the case of the bridges, some were built with the help of foreign engineers and they reflected the vast number of experiences with which builders had to design with foreign components for different technical applications. Again, as in the case of the bridges, the true experience for engineers in creating architecture in Venezuela was not only in the building part of the activity, but also in remodeling such structures when the needs so demanded it. In these types of works, we can mention the transportation of some nineteenth century buildings, of different functions, to new places during the first decades of the twentieth century.

With an uncertain date or place of origin, the first fact concerning the *Unión Fabril Cigarrera* (Cigar Mill Union) is given as 1897, when its two curved structures could be seen in a Caracas skyline as published in *El Cojo Ilustrado* (*N° 142.* Caracas, 15 November 1897, p. 862). Internal panoramas of the two different structures that made up the mill were published years later in the *Revista Técnica del MOP*. None of the reviews gave any further information as to their origin or original builder and it was coincidental to find them on totally different places in the Caracas centre. Urban legends refer to a possible French origin for the two rebuilt orphan structures, but there is no evidence to back them.

Figure 10. Unión Fabril Cigarrera, Caracas (*Revista Técnica MOP N° 12*, December 1911, p. 591).

As in the case of the aforementioned mill, there is scarce information about the origin of the Racetrack Grandstand built around 1895 by Alberto Smith (1861-1942). It is supposed to have been made of English cast iron. Its importance lay in the modern structure that made possible the viewing of and participation in sports in Caracas suburbs. Similar considerations about its cultural significance were made when the said Grandstand was moved in 1908.

With this action, architecture with modern materials and building technologies in Venezuela acquired the possibility of having an ephemeral character. The work was made almost surely by Smith and it was surpassed in 1931 when the old stand had to be repaired and was built using a reproduction of it as part of the improvements to the racetrack. The new stand for the *Hipódromo Nacional* was apparently just like the old one, but steel was used instead of cast iron and even on the old stand, some components had to be changed for steel ones. A Venezuelan firm, *Construcciones Metálicas*, managed by José Antonio Ayala and Gustavo Wallis (1897-1979), had

acquired great experience with components brought from USA and were able to copy them from models and to build new structures to complete the sports infrastructures.

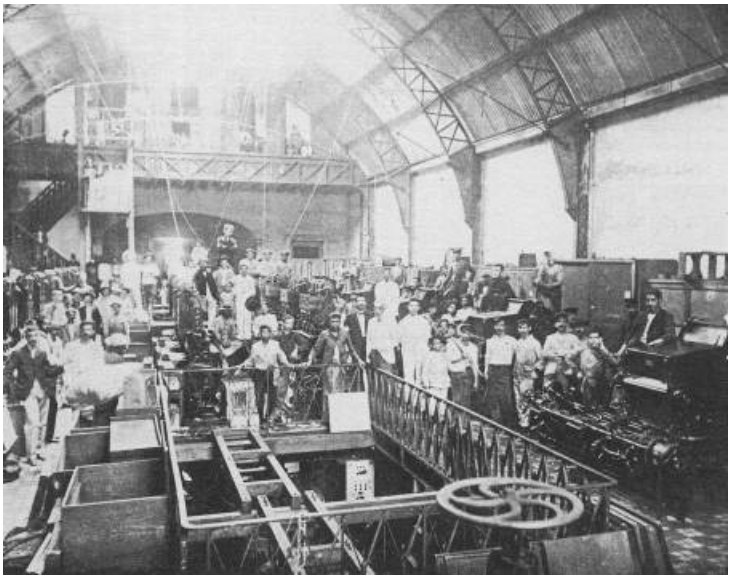

Figure 11. Unión Fabril Cigarrera (*Revista Técnica MOP N° 12*, December 1911, p. 592).

Figure 12. Grandstand of Racetrack, Caracas (*Archivo L.F. Toro, Biblioteca Nacional de Venezuela*).

French, Belgian or British ancestries were common in ideas and in materials used in Latin American architecture until the war of 1914. This event converted the nearest USA ironworks, then expanding and looking for new clients, into a privileged supplier of building components. That is why Gustavo Wallis made his experience known in North America and made himself a representative firm for all kinds of modern products brought from there.

Like the aforementioned cigar mill, the *Mercado de San Jacinto* was made up of a group of structures determined according to the possibilities of the plot. Its construction became a long process which started when the market was moved from the *Plaza Mayor* (Major Square) in 1865, but the cost of the construction together with all sorts of misunderstandings delayed the conclusion of the works until 1897.

Setbacks in the construction of such markets forced a group of engineers, Venezuelan and foreign, to participate even further in the undertaking. Two proposals, one in 1852 and the other in 1853 to purchase a foreign metal structure were set aside because it "included iron brought from abroad when instead it could use national funds which could be used locally for the making of the works with native materials" (Zawisza 1988, vol. 2, p. 76). It was not the first nor the last opportunity in which metal structures were discarded because of their costs, not so much for the materials as for their transportation to La Guaira and from there to Caracas.

The clearest manifestation of such type of built structures was that commissioned by the engineer Henry Rudloff (-1895), which consisted of trusses supported by bearing walls, covered with metal sheets of the same North American origin as the engineer. Such works were interrupted, as Rudloff died and a long judicial proceeding followed. Finally, in 1894, the market's construction was initiated. The civilian appearance of the building, including cleanliness and public sanitation, were main provisos to accomplish its conclusion. Engineer Juan Hurtado Manrique (1837-1896) considered primarily that people moving inside the building were as important as its ventilation. That is why he considered a metal structure with no internal obstacles.

The Caracas Market finally became a four vaulted covered roof, a development made of Belgian iron from the *Societé Constructeur La Metallurgique*. Norbert Paquet, who represented the company offered to assemble it himself. The proposed price had no competition and Hurtado Manrique's death left him completely in charge to finish the structures. Two expensive projects, two engineers' death, lawsuits and more than forty years were necessary to build the new San Jacinto Market Hall.

The market would grow as Venezuelan engineers' experience and in 1928 a new ground-floor was built to include electric refrigerators, which implied the substitution of the original base with a concrete slab with steel beams. The building bases were changed with all the structure in its place, but it was not the only building advance explored at the time. It was dismantled in 1942 and the

structures were divided into two groups to build them as two new market halls in different places in the city. One of them reproduced almost identically the image of the original market, the other was modified and installed over a three stories high new building by the Swiss professional, experienced in metal structures, Carlos Blaschitz (1890-1974).

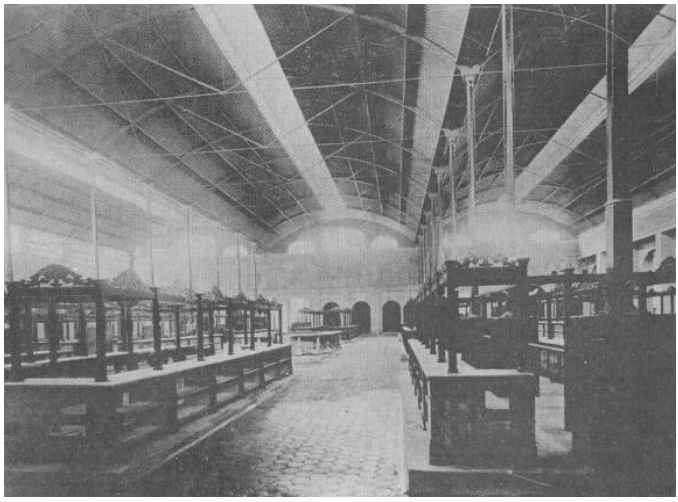

Figure 13. San Jacinto Market Hall, Caracas (*El Cojo Ilustrado Nº 141,* Caracas, 1 November 1897, p. 824).

Figure 14. Part of San Jacinto's Market on Catia, Caracas (Archivo L.F.Toro, Biblioteca Nacional de Venezuela).

Like the rationale of the bridges, those buildings became laboratories for Venezuelan engineering, where assembly and dismantling options revealed the considerable advantages of metal structures over other alternatives. But the outstanding aspects of these foreign iron buildings in Venezuela during the years under consideration was shown in the Maracaibo Market Hall (1928-32). Budgets for the structure were obtained from *Five-Lile* and *Ateliers Gilar* from Paris, but the commission was given to *Richter & Picks Industrial Engineers London E.C.* The material employed was "iron from Birmingham steel mills" (Zawisza 1989, p. 104). Leon Hoet (1891-1944) was in charge, a Belgian who worked before in Maracaibo's slaughterhouse helped by the manufacturer's German engineers.

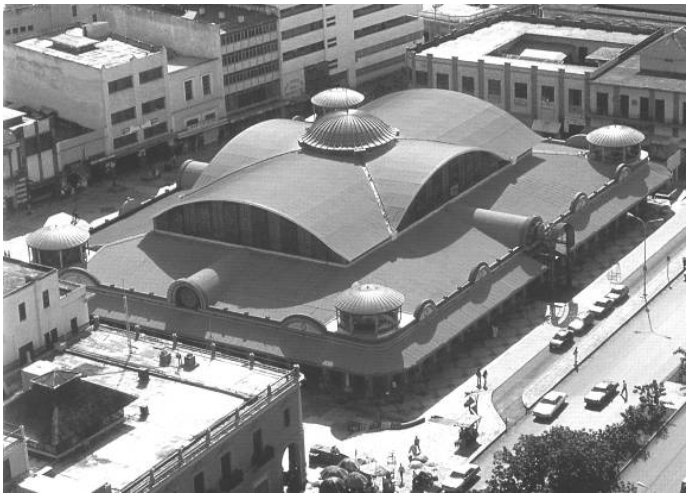

Figure 15. Maracaibo's Market. Leon Hoet, 1928-31 (Archivo Centro de Artes Lía Bermudez).

Besides theatres, markets, slaughterhouses and mills, the lecture hall for the Caracas National Library was the result of covering the patio on the ancient Franciscan Convent with a structure inspired by Labrouste´s Parisian library. The envelope in Caracas was totally different, but Alejandro Chataing (1874-1928) did not miss the opportunity of following such a guideline in his 1911 work given that it was one of the most important examples of nineteenth century architecture. Complete imported structures could be sketched in engineering offices in Caracas, Valencia or Maracaibo and subsequently commissioned by said commercial firms to the manufacturers overseas. As time went by, they were able to design by taking into consideration whatever inventories were stocked in Venezuelan warehouses.

The value of those professional builders

Dissertations, classes and graduation thesis at the *Escuela de Ingeniería of the Universidad Central de Venezuela*, were events that served as an active forum about structures, materials and building technologies. In a country where almost all architects were first engineers, some of them with

graduate studies in fine arts academies, they were prepared to build roads, aqueducts, tunnels and all kinds of buildings in the Beaux Arts Tradition.

The research that originated this paper, still in progress, shows a mix of foreign names between structures and builders (some inaccurate about their origin). But it is important to note the use they made of such foreign technologies and their contribution to the country's modernization. With iron architecture and infrastructures there emerged a contemporary history to this one which referred to the decades involved in the testing of concrete structures developed by these and other builders in Venezuela.

From Luciano Urdaneta with Henry Cook and their experience with the Puente de Hierro and all the structures that were subsequently added to the Caracas Capitol, we found names of Polish, French, German, Swiss, Belgian and North American engineers and builders who participated in Venezuelan public and private works. Almost the same nationalities were represented in the foreign structures they built in the country. With them, we observe a growing number of Venezuelan professionals, some of whom became really important in the developing process of local engineering and set a good technical precedent for its modern architecture.

Backing such engineers, architects, builders or structures of different nationalities, their value resides on their capacity to improve and to take advantage of modern structural facilities given the ephemeral nature of some of them. Of special importance is the consideration of recycling the materials and establishing new configurations with the old materials. That became a value added characteristic for the professional who offered his services to the Venezuelan construction industry.

European technologies were universal at the end of the nineteenth century, because similar phenomena occurred throughout the world since 1850, when British industrialized products were offered to the rest of the world in Exhibits held at the Crystal Palace in London.

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