

Foundries and metallic architectonic elements manufacture of the 19th century in Recife (Brazil)

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ECONOMIC RENAISSANCE AND STRATEGIC POSITION

With the reduction of gold reservations especially alluvium in the province of Minas Gerais, the activity rendering high benefits to the metropolis was agriculture especially sugarcane. The economy of Pernambuco stifled by the precious stones, diamonds and gold of the Brazilian Southeast recovered, in the second half of the 18th and in the beginning of the 19th, century the economic prestige of the older day was recovered as well. In those years, exports resumed their growth and the ascension continued up to 1890.¹ The French revolution contributed to this economic renaissance as well as the colonies producing tropical commodities. Later on, with the Napoleonic wars, the European blockade and the disarticulation of the vast Spanish empire in America provided Pernambuco with great economic advantage.² The recovery of that province was so outstanding that in 1812 sugar production already surpassed that of the beginning of the 18th century.³

However, the situation of Brazilian rural sugar producing provinces, among them Pernambuco, was not to last long. With the end of the Napoleonic wars and the European political stabilization sugar production in the Antilles and in India was recommenced. As a result, the product suffered continuous devaluations in the international market. In addition the Western Indies forced by the 1834 Act to employ free men in their sugar plantations, would seek protection from the British Government. To meet the

requests of English planters in 1842 Great Britain heavily taxed the sugar producing countries using slave labor and that directly affected Brazil.⁴ Another contributing factor was the thriving beet sugar industry, especially in France, causing many problems to the economy in Pernambuco, for to compensate the scarcity of the colonial sugar due to the Napoleonic blockage Europe had been developing beet sugar since the beginning of the 19th century. The situation got worse following the war when the industry received governmental protection and established itself as the principal competitor of sugarcane sugar.⁵ The numbers are revealing for the value of the ton of sugar, which was of 24 gold pounds per ton from 1821–1839 in 1831–1840 dropped to 16,8, or, approximately seven pounds less per ton.⁶ Therefore, when considering the region's sugar hegemony in the international market lasted only the period of European conflict, it was still sufficient to settle the basis of the slow industrialization process beginning in the second half of the 19th century.

The opening of national ports to the foreign markets in 1808 compounded on these political and economic events. From that date on agricultural equipment, foundries, and mechanic shops began to open in Recife. In the beginning, they did maintenance work. Afterwards they manufactured always copying imported products, balconies, gates, grates, mensules, beams and even steam engines. Thus, an environment was created in which the expertise of working metals began to gradually grow not only in the capital but

also in some of the cities in the interior. At that time there was a Society for the Support of the Art in Iron⁷ founded in 1881 comprised of metalworkers, forgers, blacksmiths and tinkers producing furniture, grates and doing equipment repair, specially agricultural ones as well as small services, the ones that did not interest the larger foundries.

Therefore, the economic surge had an outstanding role in the introduction and replacement of technology

in the province. However, all became possible specially due to the fact that the city was located more to the East of South America being an almost mandatory port for the routes to the West of the South Atlantic. In addition, the port comparable to the Port of Recife, in the mid 19th century, the port of Salvador, occupied that position but its proximity to Rio de Janeiro eventually deviated many of the commercial routes directly into the capital of the country.

Table 1. Movement of the Ports of Recife, Salvador and Rio de Janeiro in 1866⁸

| | Rio de Janeiro | Recife | Salvador |
|------------------------|-----------------|-----------------|-----------------|
| Ships | 4506 | 3173 | 1707 |
| Direct foreign imports | 73.844:227\$000 | 22.221:299\$000 | 17.878:203\$000 |
| Travellers | 57122 | 39353 | 31915 |

FOUNDRIES AND MECHANIC SHOPS

The fifteen existent metal foundries in Recife, in the middle of the 19th century and beginning of the 20th century were identified especially through newspaper ads. It was perceived throughout the research that there were two marked differences in the profiles of these Companies. The majority of them attempted competing with imported products specially in furnishing sugar mills parts and the remainder, on the other hand, acted as importing agents.

In the first profile one could include Starr & C^{ia}, Caldeiraria Nacional,⁹ Fundação de Francisco Antônio Correia Cardoso,¹⁰ Fundação Villaça,¹¹ Grande Caldeiraria de Domingos Ferreira & C^{ia},¹² Fábrica and Fundação de Bronze de Braga & Sampáio,¹³ Caldeiraria e Fundação de Bronze de José Laroca & C^{ia},¹⁴ Fundação Santa Rita,¹⁵ Oficina Mecânica de Simplicio José de Melo,¹⁶ Caldeiraria Central de Eduardo de Mesquita Cardoso¹⁷ and Andrade & Leal.¹⁸ Among them, the first one presents in addition to the ads in the newspaper, filed documents with installation descriptions and production which X-rays and indicates in what circumstances foundries were assembled in a city that did not possess the raw materials nor tradition in the trade.

Its founder the Englishman Christopher Starr, came to Recife in January 12, 1820. He was 44 years old at the time and in the beginning he dedicated himself to the

maintenance of the almost inexistent manufacturing plants in Pernambuco, specially of «machinery dedicated to the preparation of cotton».¹⁹ He perceived in this activity, influenced by the industrial thinking of his country that the cotton planted in the province could be manufactured prior to exportation. Therefore, he assembled a cotton manufacturing plant in 1820 in the village of Limoeiro but the business did not produced the desired results for «the principal motive for the plant abandonment was the impossibility to gather sufficient cotton to keep the plant in constant operation».²⁰ But in 1829 he decided for another larger and more ambitious venture, to assemble a small foundry in Recife. This way one of the most important metal manufacturing plants began in Recife in the 19th century.

The oldest physical description that could be analyzed is an entry in the diary of D. Pedro II during his visit to the city in 1859. At that time, approximately 60 people worked there and in only five years the number had almost doubled. These were «Englishmen, Portuguese, Germans and locals totaling 110».²¹ The Englishman work rhythm was rigorous. He would open at six in the morning and following a small pause of half an hour for lunch he would close at six in the afternoon. His foundry in 1859 had seventeen furnaces, of which the three largest ones were to smelt iron and the remaining were for the forgeries. In addition there was a die

shop, where maybe the once lost wax technology was applied for a record of 1860 depicts that «the national ship Itaberá, landing in Rio de Janeiro», brought «wax, 2 boxes for Christopher Starr».²²

Also located in the Public Archive of Pernambuco, the blueprint of the foundry of 1864. Part of the terrain's dimension of approximately 13.000 m², the information pertaining to it is scarce but the list with over thirty equipment serve as a basis to imagine that this was one of the largest manufacturing facilities in Recife in the 19th century. Among the various existing equipment there were two 14 inch dies, a torque machine, a plane machine, two boring machines, a steam fueled hammer, two steam motors for joint or separate operation, a ventilator for the blacksmiths, a mill to produce charcoal powder, a ventilator for the furnaces, a large chimney, a tubular boiler, two hothouses, a furnace to smelt iron, nine iron gantries, a hand oven and 3 smelting furnaces for blacksmiths.²³ At the time it could be considered an industry for the word meant «art, ability to make a living, mill, the art of chiseling, to do mechanical work».²⁴ Thus to invent, create and build was equivalent to industrialize.

In the face of this industrial trait and pioneer of the foundry, on the other hand there were two obstacles for the industry in Recife, especially the ones doing metalwork. One of them was the importation taxes for raw materials and the other the competition of European manufactured products for agriculture which in 1857 were taxed a mere 5%. In relation to the first one the foundries owners could do nothing. The fault lied in Government and its lack of interest. Two facts that occurred with Starr illustrate this lack of protection very well. Since 1830, he had requested tax exemption to import iron but only got it three decades later. Even then, quantity restrictions were made for he could only import sufficient supplies for one year. For this reason, in the following year, he again attempted but this time «1.800 tons of casted iron in rough ingots, 240 laminated and 100 bars and rods». A quantity, thought Starr to be smelted during a long period, but unfortunately even if his Company was considered a National Plant by Decree 526 of July 1847, the request was denied. Another fact happened when he was traveling to the United States and England to «hire workers. But in the course of such diligent task he heard there would be considerable change in the Customs Tax System which obliged him to stop all hiring proceedings».²⁵ Because of these and

other facts, he regretted to confess, «in such circumstances it's almost impossible to go on manufacturing anything of the kind [?] or even to exist for a long time in the country».²⁶ This lack of protection with the Brazilian manufacturing plants was criticized by the province's president himself who stated that «trade shrinks, for instead of protecting and supporting the government of this country has offered complete indifference and abandon compounded with inconvenient and unfeeling rigor».²⁷

In 1850, two circumstances marked the history of the foundry. The news of the death of Christopher Starr's wife, Susana Star, in 1853²⁸ and, two years after, a severe accident when «without any reason the boiler exploded and in the attempt to save the victims three dead men and four lightly wounded ones were removed and two severely burnt by the boiler's water».²⁹ The following decade marked the end of the foundry. Starr was then 80 years old and attempted for the last time to obtain some profit from the facilities of his Company. He pleaded for help from the Emperor «he would cede his establishment to the Imperial Government for a reasonable financial compensation, with all the shops, buildings, land and warehouses for the establishment of the War Arsenal of the Province».³⁰ This would be, according to him, a great opportunity for the government. He argued in a patriotic way and taking advantage of the fact that Brazil was at war with Uruguay and Paraguay that the location was ideal «to receive the War Arsenal not only because it has sufficient rooms for the various activities of the Organization, but because of all of the machinery and adequate tools to manufacture all types of blade weapons, fire weapons and any other devices required to a War Arsenal. Brazil will not need to procure the weapons it needs for its army, navy and fortress from foreign countries; we currently have the imperious need of manufacturing them in the country and we do not have to procure these indispensable objects for the practice of military science abroad, for they are needed for the protection of any State».³¹ The major advantage would evidently be his for he would be compensated for a Company in dire economic difficulties.

His proposal was not accepted and in 1870 the obituary in the *Diário de Pernambuco*, announced that «from the last ship coming from Europe there's news that Mr. Christopher Starr an English subject and owner of a major iron foundry called Aurora located

in Santo Amaro, has passed away, he was the owner of the first industry of its kind in the Province». ³² Three years later the foundry was put to sale but as no buyer was found, it was auctioned.

The Foundry building was described at the auction announcement. At the definite closing of its activities the building had «iron beams and thresholds. Five rooms, seven bedrooms, kitchen, a roofed terrace with a magnificent view, yard and garden. The rooms in front can be reverted into a great salon for the compartment dividing them is movable, there's a pipe system for water and gas, bathroom and fences around the yard with greenhouses and many trees». ³³

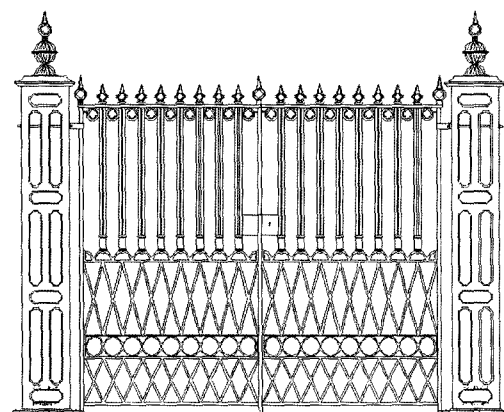
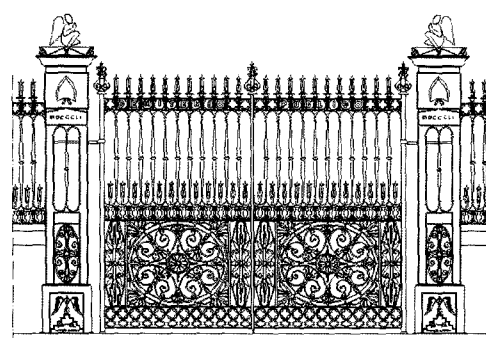
A frequent trait of Starr was to state that he manufactured all that he sold. In 1848, for example, with some typical advertisement newspaper exaggeration, he bragged that had «the most modern and complete machinery that science introducing, comparable . . . and selected among the best in Europe, truly able to offer sugar mill owners all possible credibility». ³⁴ Years later, like in 1851, the same emphasis: «since the beginning in of 1829 it has constantly increased and has currently achieved such perfection that it is not inferior to the best available». ³⁵

That means that, it did not only compete with domestic foundries but with foreign ones too, and in this aspect Bowman, as we will see later, in addition to other establishments, was more coherent. Maybe Starr refused to give up and realize that competing with foreign foundries due to the legislation of that time and the material and technical dependency was an almost impossible task. The fact is that few foundries in Recife were aware of this situation, and when perceiving the lack of governmental interest, had no other choice but to act as commercial agents as well. The owner of perhaps the biggest of them all did not do this and that is the reason why, following his death the remains of his company had to be auctioned.

Among his products, the one that is most outstanding and far ahead of other foundries in Recife, is that Starr is said to have built the first steam engine in Brazil for the Caraúna de Souza Leão sugar mill. At the time of the Emperor's visit approximately fifteen of them had been sold to other sugar mills of the region and not only in the 1864 document, as well as in the diary of Pedro II and in newspapers adds there are references to his pioneer endeavors. In addition to this, a hydraulic bell was casted for the Arsenal of the Navy for it weighed around seven tons

and there was space to build two medium sized ships for there was a channel of the river flowing into the plant itself through which ships navigated. Pedro II registered that he had seen an iron boat, possibly used to move merchandise. ³⁶ These are amazing facts for a rural region in 1859 and contrasting with the policy, or lack of it, adopted by the government and related to national manufacturing plants, specially the ones in Northeast Brazil.

In terms of architecture he announced that he could build «iron bridges of all dimensions, grates,



Figures 1a and 1b

Two gates models of the Star foundry in the city. The one in the left was at Ruy Barbosa Avenue nº 1229 and 1426, at the Hospício nº 51, at the cemetery of Olinda, in the cemetery of the Englishmen, and at the Caxangá avenue nº 3860. The left one and example of exquisite workmanship and decorative elements in forged iron in the cemetery of Santo Amaro and in the Church of the Ordem 3ª de Nª Sª do Carmo in Recife

verandas, gates, columns, (. . .)» and almost all classes of metal structures. As for example the cases of the Brunzinho and Varadouro bridges.³⁷ However, unfortunately, a few samples of the Starr products still remain and there are, nevertheless, some gates in the city. Among those the ones in the Ruy Barbosa Avenue nº 1229 and nº 1426, at the Hospício street nº 51, in the cemetery of Olinda dated 1858, of the cemetery of the English dated 1814³⁸ and in the Caxangá avenue nº 3.860. In addition to other two of the cemetery of Santo Amaro dated 1851 and of the Church of Ordem 3ª de N. Sra. do Carmo dated 1858, are outstanding in terms of exquisite finish and ornamental elements (Figures 1, 2, 3 and 4).

Still focusing the profile of the foundries that «compete with the plants in Europe in quality and workmanship»,³⁹ in one of the ads of Andrade & Leal —Fábrica de Caldeiraria, there were— typical products such as alembics, tacks, tin furniture, iron carts, gates verandas and gratings⁴⁰ —an illustration



Figure 2
Detail in forged iron of the main gate of the Santo Amaro cemetery



Figure 3
Gate of the Englishmen Cemetery



Figure 4
Gate of the nº 1426 house at the Ruy Barbosa Avenue

depicting the technique used at the time. These are workers that with the manufactured caldrons such as the ones used in the sugar mills (Figure 5).



Figure 5
Ad of the Fundação Andrade & Leal-Fábrica de Caldeiraria (June 2, 1851. *Diário de Pernambuco*. APEP)

The Grande Fábrica de Caldeirarias and Fundação de Sinos Villaça (Boiler and Bells Plants) placing ads in the newspapers up to 1905,⁴¹ also used illustrations (Figure 6). Iconographic materials enable the identification of the same technique employed by Andrade & Leal. These workers and slaves produced boilers, alembics, tacks and even copper pumps.⁴² The ad is a reference to the delay of some of the foundries or stated they were not much different of the ones in France one century before, as an example of the ones appearing in the *L'art du Serrurier de 1767*.⁴³



Figure 6
Ad of the Fundação Villaça (August 12, 1872. *Jornal do Recife*. APEP)

The second profile, or the foundries that got into importation, and in some of the cases represented foreign companies, belonged to companies such as Cardoso & Irmãos,⁴⁴ Fundação Geral and Oficina de Samuel Power Johnston & C⁴⁵ and Bowman. Especially the last one, like Starr, due to the documentation on file and because some of the products still exist, mostly architectural ones, reflect with greater detail the peculiarities of this type of activity in the city.

The sources consulted indicate two dates for the Bowman foundry foundation. One of them is a booklet of the foundry itself, printed in 1855, from which one is able to infer that it existed since 1844.⁴⁶ But, in the diary of Pedro II, the date of 1835 is indicated as the date the company opened for business in the city.⁴⁷ Apart from the discrepancy of one decade, the brochure depicts with a certain amount of detail, its technical level. The establishment occupied a terrain of 3.000 m² and, according to Bowman, he employed approximately «60 officers, every one of them Brazilian».⁴⁸ His infrastructure was comprised of two main cranes, in addition to other five cranes that ran on three ways. The mechanical force was obtained through a six horsepower steam engine operating three lathes with the ability to fold almost 2,5 m wide parts. In addition there were machinery to smooth, perforate, screw, forge and cast iron, as well as grindstones and bellows for furnaces and forges. The sixty workers were provided with two furnaces for iron and two furnaces for bronze. The largest was capable of producing 1.350 kg per hour and, according to Bowman, the monthly production at that time was of approximately 20 tons.⁴⁹

This was a middle-sized foundry and could be considered with Starr as the first pre-industrial establishments in Pernambuco. But, the data when confronted with that of European companies such as, the *Siderurgie en France & à L'Étranger*,⁵⁰ indicated that the two represented only small mechanical shops capable of melting iron for balconies, grates, to furnish parts and maintenance to the sugar mill plants. However, the issue is that we are talking about a country that, three decades before was still a colony of Portugal, and therefore in this context a true pioneer spirit prevailed.

At the time, the State desired to facilitate the acquisition of machinery for agriculture as well as to replace primitive processes principally concerning

sugarcane and cotton. But, on the other hand the sugarcane owners would then cease buying their products from locals and would directly import from the European foundries. The more complexity mechanisms unavoidable were imported but, parts and replacement materials, such as tacks, plaques, beams, tubes could be manufactured in Recife. If taxes were to be cut, then why not buy directly from the European manufacturers? Therefore, for manufacturing plants, principally mechanical shops and foundries, the measure would result in severe negative consequences. The region needed to become technically modern such as the government proposed to, but this implied in sacrificing the few manufacturing plants existing in Recife. The problem was not easily solved and Bowman as well as other foundry owners feared for the future of their business for they thought that «if in fact taxes on imported machinery are cut it will become absolutely impossible to have them manufactured in the country because of the price competition with the imported ones and in consequence I will not have other alternative but to layoff my employees and close my business».⁵¹

Bowman, as well as Starr, also began manufacturing steam engines. At the end of the 1850's, he had already built «three steam engines and mills and implements such as 6 horsepower for mills».⁵² Even such initiatives like that were blocked by technical superiority of the foreign manufactured products. That is why some sugar mill owners, even when having to pay more would rather order directly from European manufacturers. The reason was that «the products of the Starr foundry were not good and, Bowman was too expensive: I have sent for the main parts from Europe» one of them confessed to Pedro II. Another sugar mill owner stated that «Starr's low price results according to Lourenço de Sá e Albuquerque, in the bad quality of the products, Bowman's products are better according to what Boa Vista said».⁵³ And this could not be different. These were the first metalworkers of the city and the intention of competing with the English, French and Belgians was a challenge to be admired.

In 1857, Bowman's fears were confirmed. The taxes of 30 to 35% excised from agricultural machinery since 1844, from Alves Branco importation tax, was reduced to a 5% tax on all equipment. From then on the disadvantages of the local foundries in relation to the foreign ones increased. To compound

the negative situation, there was a local Provincial Regulation number 211 dated from 1852 that extended the benefit of the tax exemption awarded to Alfredo and Eduardo Morney in 1849 to all imported agricultural implements.⁵⁴

Because Bowman's advices had no standing and importation taxes were in reality reduced, in the face of this new competitive and unequal context the only thing left was to plea at a local level. Therefore, through four pleas the taxes charged to the local industries were contested. Of the four petitions, the three first ones were denied and probably the same happened to the fourth. The texts and contents are similar, but the third one in particular the part of the text describing the critical state of the city's foundries due to the policy adopted by the government is outstanding:

there are in this city four iron foundries, and only three actually operates having reduced the number of workers, and the one in the Aurora street is closed because no one is willing to rent it, although it is well assembled. There are houses at the Rua B. Do Triunfo closed with no one willing to rent them which were formerly ironsmiths, metalworkers and boiler manufacturers shops.⁵⁵

However if the foundries, according to Bowman, were in difficulty, how can one explain the increase of manufacturing ads in the newspapers starting exactly during that period? In reality, although governmental measures had on one side wiped the first foundries of Recife, on the other hand, it encouraged the importation of machinery, and as a result, the emerging foundries offered basic parts and mills maintenance services to sugar mill owners, their main clientele. That's what happened to Bowman and perhaps that was the only way his company was able to survive. In that way the initial position like in the first 1848 ads is similar to Starr's when he stated he could produce «as perfectly as the best plants in England and much superior to the ones generally imported from that country»⁵⁶ had changed. Afterward because of the competition and not being able to resist for long, he began to represent foreign companies, or to become an ally of his former competitors. In addition to the foundry, he then became an importer and commercial agent. An ad, published in the *Jornal do Recife* in 1878 highlights the following: «for the orders of vacuum boilers, devices for sugarcane juice cleaning, evaporations or

steam cooking etc. This foundry has the best offers due to its relationship with the main manufacturers of England, France and Belgium». Besides profiting with the commission, the same ad enables one to note that the Company would maintain its principal activity for it would «contract for the supply, training on the job of any machinery, all together or one by one, furnishing the original accounts and patents for the appreciation of the buyer».⁵⁷

Bowman's ads are frequent throughout the whole half of the 19th and the 20th century. There three phases in the business. The first as a mechanical shop specially producing «a great variety of caldrons for sugar mill, of all sizes and models, the most modern and approved. In the same plant we accept orders for steam engines, water wheels, spiked wheels and all other machine parts, with perfection and reasonable price».⁵⁸ Two decades later he began to represent European companies, specially English ones for they «will remit at the order of clients, reminding them of the convenience of doing their shopping through someone who knows the equipment well and is able to render assistance in case of need».⁵⁹ At last, in the ads of the beginning of the 20th century, also advertised construction services «of bridges, buildings, orders for machinery and assembly for any plant, assuring excellent manufacturing results».⁶⁰

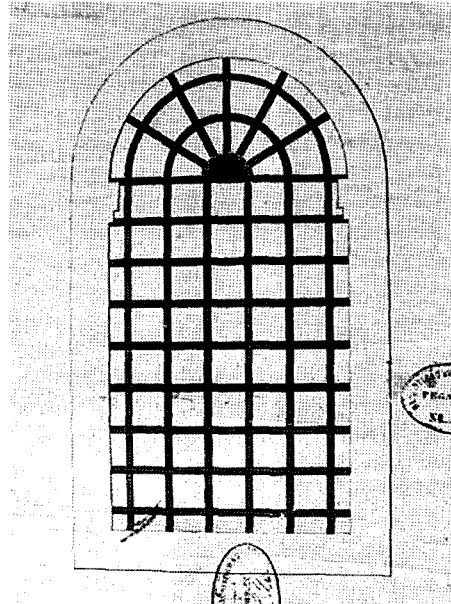
Of the six decades of existence, one of the longest among the city's foundries, only the gate of the old Detention House remains to document the products of that company. Although there are no inscriptions proving where it was forged, there are strong indications that it must have been built by Bowman. One of them in the *Diário de Pernambuco*, in the Official Part in March 2, 1855 indicates that the Treasury inspector of that time authorized that «the Director of Public Constructions should contract with David W. Bowman & Cia. The bill of such construction for 240 rs. for each pound of gate and 200 rs. for the large lateral grates».⁶¹ In addition to this it should be considered that the metalwork of the Detention House was ordered as the building was being constructed, or gradually and not like when metal elements were imported from Europe and would come all in one shipment.⁶²

In this context possibly the same thing occurred with some of the metal parts of the interior of the building. There is in the State Public Archives a drawing, regretfully in very bad conditions, of the

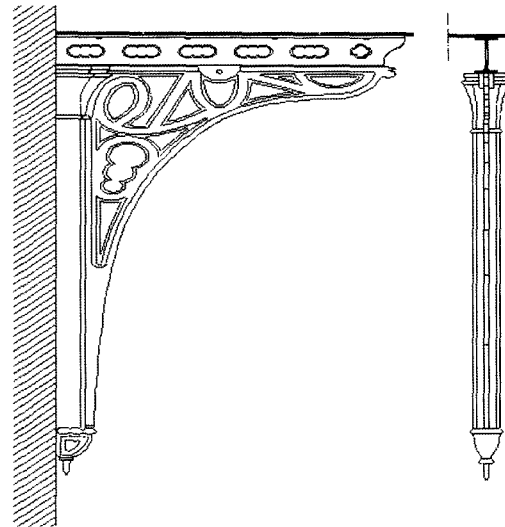
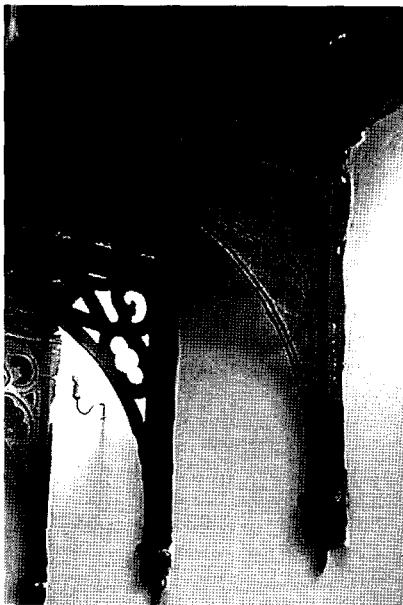
mensules details made of forged iron supporting the circulation area of the pavilions. In the first place it should be considered that the plans related to the imported metal structures were designed primarily for parts assembly and, many times, did not discriminate each of the elements but their connections, in short they was utilized like a guide to assemble. At last, because Bowman was hired to furnish gates and lateral gratings and, together with Starr & C^{ia}, were at the time the largest foundries in the city with sufficient technical expertise to produce such parts, at least if there is no proof in which foundry they were manufactured, it's possible at least to think they were forged in Recife (Figures 7, 8, 9, 10 and 11).



Figure 7
Iron gate of the old Detention House in Recife manufactured by Bowman foundry



Figures 8 and 9
Window and drawing of the grates of the old Detention House of Recife, possibly produced by the Bowman foundry Bowman (APEP 1852)



Figures 10 and 11
Mensule of the Old Detention House forged in Recife

NOTES

1. Eisenberg 1977, 77.
2. Furtado 1980, 92.
3. Lima 1976, 221.
4. Wright 1978, 18.
5. Eisenberg 1977, 45.
6. Lima 1976, 199.
7. August 19, 1881. Section: Revista Diária. In *Diário de Pernambuco*.
8. Pereira. 1972. *Notícia dos principais portos do Brasil e dos gêneros que por eles saem*. In *COIMBRA*. 72–76.
9. May 9, 1890. *Diário de Pernambuco*. Arquivo Público Estadual de Pernambuco. (APEP)
10. May 2, 1868. *Diário de Pernambuco*. APEP
11. May 9, 1905. *Jornal do Recife*. APEP
12. July 4, 1894. *Jornal do Recife*. APEP
13. September 19, 1863. *Jornal do Recife*. APEP
14. February 23, 1894. *Jornal do Recife*. APEP
15. August 15, 1906. *Jornal do Recife*. APEP
16. March 21, 1896. *Jornal do Recife*. APEP
17. May 19, 1875. *Diário de Pernambuco*. APEP
18. June 2, 1851. *Diário de Pernambuco*. APEP
19. July 13, 1864. *Petições de Indústrias e Comércio*. 3. APEP
20. July 2, 1856. *Diário de Pernambuco*. APEP
21. July 18, 1864. *Petições de Indústrias e Comércio*. 3. APEP
22. *Diário de Pernambuco*, August 2, 1860, Comercial Section —Movimento do porto— Importação.
23. July 18, 1864. Nota A. In *Petições de Indústrias e Comércio*. APEP
24. Silva 1818. Instituto Arqueológico, Histórico e Geográfico de Pernambuco (IAHGP).
25. July 18, 1864. *Petições de Indústrias e Comércio*. 4. APEP
26. *Ibidem*, 3–4.
27. January 15, 1875. *Diário de Pernambuco*. APEP
28. December 3, 1853. *Diário de Pernambuco*. APEP
29. November 8 and 9, 1854. *Diário de Pernambuco*. APEP
30. July 5, 6 and 18, 1864. *Petições de Indústrias e Comércio*. APEP
31. *Ibidem*.
32. March 30, 1870. *Diário de Pernambuco*. APEP
33. September 23, 1851. *Diário de Pernambuco*. APEP
34. May, 1847. *Diário de Pernambuco*. APEP
35. September 23, 1851. *Diário de Pernambuco*. APEP
36. D. Pedro II 1859, 69–70.
37. 1858. *Relatório de Obras Públicas*. 13–17.
38. The date 1814 (MDCCCXIV) that could be still observed in that gate is a mistake because Starr arrive in Recife in 1820.
39. June 2, de 1851. *Diário de Pernambuco*. APEP
40. *Ibidem*.
41. May 9, 1905. *Jornal do Recife*. APEP
42. July 2, 1879. *Jornal do Recife*. APEP
43. Duhamel, M. *L'art du Serrurier* In: Carria 1995, 29.
44. March 17, 1863. *Jornal do Recife*. APEP
45. July 9, 1872. *Jornal do Recife*. APEP
46. Folhetos Raros III, 400/900, cx. 29/0059. APEP/PE
47. D. Pedro II 1859, 74.
48. Folhetos Raros III, 400/900, n. 59/cx. 29, fl. 1. APEP/PE
49. *Ibidem*.
50. Helson 1891.
51. Folhetos Raros III, 400/900, n. 59/cx. 29, 2. APEP/PE
52. The significant different related to booklet dated 1855 relates to the capacity of the main furnace that from 1350 Kg /h in 1855 to 2t/h in 1859. The rest of the equipment suggests that few changes in the years between the two sources were effected D. Pedro II 1859, 74.
53. *Ibidem* 1859, 74–128.
54. Coleção de Leis do Império do Brasil de 1852. 15: 213. 8ª caderno. APEP
55. 29 April 1875. *Petições de Indústrias e Comércio*. 30–38. APEP
56. November 22, 1848. *Diário de Pernambuco*. APEP
57. January 31, 1878. *Jornal do Recife*. APEP
58. November 22, 1848. *Diário de Pernambuco*. APEP
59. January 3, 1869. *Jornal do Recife*. APEP
60. February 27, 1907. *Jornal do Recife*. APEP
61. March 2, 1855. Official section. In *Diário de Pernambuco*. APEP
62. APEP-R.O.P 1853, 3–8; R.O.P 1854, 14–25; R.O.P 1855, 33–34; R.O.P 1858, 12.

REFERENCE LIST

- Barbosa, Francisco de Assis. 1958. *D. João VI e a Siderurgia no Brasil*. Rio de Janeiro: Biblioteca do Exército.
- Carria, Fabio. 1995. *Tecniche, Recupero e Stili*. Milano: BE-MA.
- Coimbra, Créso. 1974. *A Visão Histórica e Análise Conceitual dos Transportes no Brasil*. *Brasiliense*. Rio de Janeiro: Ministério dos Transportes.
- Costa, Ângela Marques da; Schwarcz, Lília Mortiz. 2000. *No Tempo das Certezas 1890–1914*. In *Col. Virando Séculos*. São Paulo: Companhia das Letras.
- Eisenberg, Peter L. 1977. *Modernização sem Mudança - A indústria Açucareira em Pernambuco em 1840–1910*. Campinas: Paz e Terra.
- Furtado, Celso. 1980. *Formação Econômica do Brasil*, São Paulo: Companhia Editora Nacional.
- Gomes, Francisco Magalhães. 1983. *História da Siderurgia no Brasil*. Itatiaia: Belo Horizonte.
- Gile, Bertrand. 1999. *Introducción a la Historia de las Técnicas*. Barcelona: Crítica-Marcombo.

- Freyre, Gilberto. 1977. *Inglês no Brasil. Aspectos da Influência Britânica Sobre a Vida, a Paisagem e a Cultura do Brasil*. Rio de Janeiro: Livraria José Olympio.
1988. *Ferro e Civilização no Brasil*. Recife: Record.
- Helson, Cyriaque. 1891. *La Siderurgie en France & à L'Étranger*. Paris: E. Bernard & C^{te} Imprimeurs.
- Lima, Heitor Ferreira Lima. 1976. História Político-Econômica e Industrial do Brasil. In *Coleção Brasileira nº 347*, São Paulo: Companhia Editora Nacional.
- Maior, Mário Souto; Silva, Leonardo Dantas. 1992. *O Recife. Quatro Séculos de Sua Paisagem*. Recife: Massangana.
- Maior, Paulo Martin Souto. 2002. *La Introducción del Hierro y de las Estructuras Metálicas en Recife, 1830–1915*. Barcelona: Tesis Doctoral, Universidad Politécnica de Barcelona, Escuela Técnica Superior de Arquitectura.
- Mello, José Antonio Gonsalves de. 1985. Diário de Pernambuco. In *Arte e Natureza nº 2º Reinado*, Recife: Massangana.
- Silva, Antônio de Moraes Silva. 1818. *Dicionário da Língua Portuguesa no Brasil*. 1. Lisboa: Imprensa Régia.
- D. Pedro II. [1859] 1952. *Viagem a Pernambuco em 1859*. Cópia, introdução e notas de Guilherme Auler. Recife: Arquivo Público Estadual, Secretaria do Interior e Justiça.
- Wright, Antonia F. P. de Almeida. 1978. *Desafio Americano à Preponderância Britânica no Brasil 1808–1850*. Brasília: Nacional.