

Catalan industrial architecture in the last quarter of the 19th century and first quarter of the 20th century

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ABSTRACT

The economy of Catalonia experienced a major surge from the mid-19th to the early 20th centuries, primarily because of two crucial factors: first, the industrialisation process, chiefly with the development of the textile sector, and secondly the revival of the agricultural sector, with the extensive cultivation of vineyards around the land. In both cases, non-traditional architectural typologies had to be “reinvented” or built in Catalonia: the factories that manufactured textiles or other products, industrial colonies, the wineries where wine and its spirits were crafted, and the flour mills.

Keywords: industrial architecture, agricultural architecture, wineries, cooperativism, Modernism, Gaudinianism

Before achieving the economic, political and social status that made Catalonia the first and most powerful industrial region in Spain in the 19th century, both manufacturing and agricultural production were associated with the rural world, the world of the *masia* or country estate, along with mills, monasteries or priories whose roots dated back to the Middle Ages. The countryside was where wine and spirits were produced at home, either for the household's own consumption or for domestic sales, and peasants or day-labourers fuelled the paper, flour, fulling or oil mills, which were owned by the feudal lords, large monasteries or kings. The architecture associated with these kinds of activities (country estates, peasants' homes and mills) was traditional, built with the customary inertia of the peasants themselves out of stone, mud or compressed earth, and with fully sustainable thermal insulation conditions. The monasteries, however, were constructions designed by architects or builders (sometimes the monks themselves with specific training); they were more complex and sturdier, and more or less similar depending on the rule of the religious order that built it. They came with a series of outbuildings separate from the rooms and spaces used by the monastic community which were meant for farming and housing for the peasants who worked the land. But in both the domestic structures and monasteries, there were semi-underground or ground floor spaces

used as wine cellars, workshops and store rooms, many of them quite beautiful, such as the wine cellars that were housed in rooms or spaces covered with stone vaults and Gothic diaphragm arches.

The first forms of cooperation to manufacture textiles, paper or flour coalesced precisely around the mills, with their labourers and their production, and throughout the Modern Age this laid the groundwork for the country's Industrial Revolution.¹ Likewise, conflicts between the landowners and the peasants working there arose around the large farms, which led to cooperativism and agricultural syndicates in the late 19th and early 20th centuries.² The unequivocal expression of these two branches of the economy in Catalonia (and in the rest of Europe) was architecture. Bourgeois capital, associated with the new social stratum which was gaining power as they amassed wealth from industry and the market, needed architectural expression to show society, in the midst of a high degree of competitiveness, not only manufacturing quality but also “psychological” and “aesthetic” quality. Juan José Lahuerta speaks about a market society, a consumer society, in which the buildings themselves were constructed as both the headquarters of the industries and symbols of the power achieved by the owner. Likewise, the fashionable architects who built them were chosen in an even more showy fashion as a clear display of the owners' spirit of progress and modernity.³

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TEXTILE FACTORY CONSTRUCTIONS: THE URBAN MODEL

Throughout the 18th century, workshops were built in the ground floors of buildings inside Barcelona's mediaeval walled premises to manufacture calico, cotton fabrics treated with the printing technique that uses wooden moulds.⁴ The weavers hired workers who worked at home and the production remained artisanal. The introduction of technological improvements in production soon forced new buildings to be constructed which were used solely for the industry, designed as multi-storey factories following the English model. They were made with bricks and mortar covered with a coat of plaster, with a repetitive model of vertical, rectangular windows, topped with either an arch or a lintel, with vaults on the ground floor and brick pillars or wood floors on the upper storeys. These buildings were integrated into the urban grid, and their outward appearance did not differ much from the appearance of the nearby residential buildings.⁵ This model, which began to adopt the neoclassical language in the formalisation of the façades as the 19th century drew closer, became popular in other Catalan cities, and not only in industries that manufactured calico but also those dedicated to spinning, rags, cotton, shoes and paper, among others.

The steam engine and self-acting spinning mules were not introduced into the manufacturing and mechanisation process until the 1830s and 1840s (technical advances that led to social ruptures and major upheaval, as well as manipulation of the culture against the new working class by the bourgeois), and the use of cast iron also spread gradually, bringing a substantial change in factory architecture in Catalonia.⁶ The yarn and fabric factory built by the Bonaplata, Rull, Vilaregut i Cia. company of Barcelona was the first to install a steam engine and spinning machines and cast-iron mechanical looms in 1832. Installed in a four-storey building next to Carrer dels Tallers, inside the city walls, it was burned down in 1835 precisely because of its technological innovations.

The introduction of cast-iron columns as structural elements in factories (as well as in residential buildings) allowed spacious rooms to be created which could house the increasingly heavy machinery needed for modern production. These columns began to be introduced in Catalonia after 1846, and their aesthetic possibilities meant that they served as both constructive and decorative features at the same time. The range of artistic forms displayed by these columns includes moulds, tori, acanthus leaves, palmettos, symbolic emblems, flowers and classical or romantic garlands. In parallel, these patterns also started to emerge on the fabrics. The essentially functional nature of the factories, once the constructive features were determined, were lighting, ventilation and fire prevention.⁷ In the second half of the 19th century, they began to be compatible with architecture styles that had been experimented with to a greater or lesser degree in

public architecture, conveying a symbolic meaning associated with the increasing power of the owners. Below we shall examine several examples of multi-storey urban factories and industrial warehouses.

The Batlló and Casaramona factories in Barcelona

In Barcelona, the Batlló factory is a representative of the multi-storey factory. It is built on a large plot of land (60,000 m²) in what was then the town of Les Corts (which was annexed into Barcelona in 1897), on the far northwest of the city's Eixample district, shortly after Ildefons Cerdà's Eixample Plan was approved. It occupies the block between Comte d'Urgell, Rosselló, Viladomat and París streets (the latter which used to be called Indústria) and was enclosed around its perimeter by a rubblework wall reinforced with exposed brick pillars. Despite the modifications to the construction and the way it has been used over time, it is the building that has most maintained the essential features of its architecture and is categorised as an Asset of Local Cultural Interest. The architect and builder Rafael Guastavino i Moreno (Valencia, 1842 - Asheville, North Carolina, United States, 1908) drew up the project, and he was the author of six blueprints in which he followed the instructions that the engineer Alexandre Marye had defined in a previous functional programme. The builder was a fellow builder Ramon Mumbú i Bordas.⁸

The Batlló Germans company (in fact, it was company that had been relaunched) was formed in 1866 made up at first by the brothers Jacint, Feliu and Joan Batlló i Barrera, as well as their niece Margarida Batlló, the daughter of the deceased brother Domènec Batlló i Barrera. After 1867, the company purchased a series of rustic buildings where they built their factory.⁹ Construction began in 1868 and the factory started operating in early 1870. The political, social and economic crises of those years, which sparked conflicts with workers, led to a limited and increasingly meagre production, and ultimately to the permanent closure of the factory in 1889, despite its importance from the standpoint of both its architecture and its investment in machinery.

The factory was used to manufacture cotton thread and fabric, and it had two main independent buildings which housed the spinning and the weaving or looms. The layout of those two buildings, which were not centred on the plot of land, was actually perfect because over time, after the factory had closed, it allowed the lands to be occupied with more buildings without the need to tear down the original ones or transform all of them for new uses. We should bear in mind that at a later date the factory complex was purchased from the Batlló family by the recently-created (1904) Patronat de l'Escola Industrial (Board of the Industrial School, made up of the Barcelona Provincial Council, the Barcelona Town Hall, Foment del Treball Nacional [National Employment Promotion] and the Association of Industrial Engineers) with the purpose of training technicians related to the different activities

within industry. This was the seed of the future *Universitat Industrial de Catalunya* (Industrial University of Catalonia), which was spearheaded and financed by the Barcelona Provincial Council and was launched in 1908.

The two main buildings in the first stage of cotton cloth manufacturing are the ones that have become the most emblematic because of their formal and constructive features. The spinning building, the one located the closest to Carrer del Rosselló, draws the most attention because of its monumental appearance within the urban landscape. It is a rectangular building with an area measuring approximately 3,400 m²; it has five storeys and an attic, each divided into three bodies with sloping roofs. Another body running perpendicular to the first three closes the building on the east (Carrer del Comte d'Urgell), where the main façade is, on the narrowest side of the building. Two other bodies are attached on the west, one with three storeys which used to house the steam machines (currently known as *Edifici del Vagó*, or the Wagon Building), and the last two, one storey each, which housed the boilers and coal bunkers. The 62.5-metre tall smokestack was built a bit set back from them but at the same lengthwise spot on the complex; it is octagonal in shape on the out-

side but was circular on the inside; it tapers as it rises. This is a symbol of the factory and a milestone in the city, as it stands out above the remaining constructions.

The main façade of the building is symmetrically composed around a central axis which is emphasised by the presence of a clock (hence the current name *Edifici del Rellotge*, or Clock Building) and a gable two storeys tall (which was replaced by an iron pyramid with a weathervane in the early 20th century). It is framed by two rectangular corner towers which stand one storey taller, with flat roofs bounded by a rail and each with its own staircase and water tank on top. The outer walls of the building are made of smooth stone ashlar with highlighted joints, and each storey is delimited by the impostes on the walls, which also stand out from the plane of the façade. Their horizontality contrasts with the verticality of the regular lines of large windows topped with segmental arches, which illuminate the inside of each storey. The stretches of stone walls are delimited by brick edges and finishes, which confer architectural quality: the impostes and corners of the towers, the cornices of the moulds and dentils, the rear pediment, and the jambs, boundaries and arches of the openings outline the stone



FIGURE 1. The Batlló factory with the old entrance to the premises and the spinning building (now known as *Edifici del Rellotge*, or Clock Building).

while also adding a contrasting colour. This combination of stone and exposed brick – a material that was already being used in European architecture – is one of Guastavino’s contributions to Catalan industrial architecture. In the words of Jaume Rosell, it is “what is present as a functional interpretation of both French structural rationalism and English moral sincerity”. “Guastavino’s architecture brought compositional modernity and extremely functional technology that was useful for some architectural types in the 19th century. It was a kind of international architecture and the outcome of a particular fusion of the approaches of the *École Polytechnique* and the *École des Beaux-Arts*”.¹⁰

The inside of the building boasted extraordinary spatial quality, and still does. Rafael Guastavino drew up open floorplans perfect for housing the self-acting spinning machines. It was divided into six bays of equal width separated by rows of cast-iron columns with smooth capitals, devoid of decoration. These columns support wooden main beams and segmental timber arches which define the walls on every floor and are the main feature in those extraordinary spaces, along with the columns. These vaults also show an innovation in the building tradition: they are braced with round iron strips and made with a layer of tile and another thin layer of brick, layered with plaster, except for the vaults on the first storey, which are bolstered with cement mortar to support the heavy machinery. This use of cement mortar associated with timber arches is an experimental first in the Batlló factory and signals the start of a new way of building which Guastavino exported to the United States, where he emigrated in 1881, and improved over time.

The other main building in the factory complex is the one that housed the weaving, which was separated from the spinning building by a corridor called Carrer del Vent (Wind Alley). It is a rectangular, almost square, space delimited to the east and west by two one-storey wings with a two-storey central body that contains the stairs leading to the basement, which housed the looms. This was also designed with an open floorplan of outstanding proportions, with a grid of cast iron columns (aligned in 12 by 28 rows) as the only element separating the bays. Some authors have compared it to a hypostyle hall or to the mosque of Cordoba. From each column springs four three-centred arches which form brick domical timber vaults with two layers, just like in the spinning room, of tile and thin brick layered with plaster and cement mortar to avoid the vibrations of the axels and to waterproof the ceiling. The keystone of each vault is perforated with a round skylight which provides the room with uniform light.

This entire set of compositional, constructive and technical features is what would be appreciated by generations of future architects and building historians because of their innovation, functionality – as they allowed for very different later uses – versatility and beauty. Indeed, the former Batlló factory is a good example of sound conservation – especially the two buildings described above

– and the repurposing of the industrial heritage for public use, both the premises as a whole and its emblematic buildings.¹¹

The Casaramona factory (Barcelona), which was also used in the textile industry, is an example of a one-storey industrial building. It is located at the intersection of Avinguda de Francesc Ferrer i Guàrdia and Carrer de Mèxic, at the base of Montjuïc Mountain. When it was built, this mountain was practically bare and had hardly any buildings; it was not urbanised the way we know it today until the Barcelona World’s Fair of 1929. The factory is also an example of “signature architecture”, which reveals its architectural Modernist (Catalan Art Nouveau) conception and style. Yet it also has unique historicist elements with Gothic roots which were used so frequently by the author of the design, Josep Puig i Cadafalch (Mataró, 1867 - Barcelona, 1956), a third-generation architect trained at the onset of Catalan Modernism who was associated with the 19th-century Catalan *Renaixença* movement (a version of European Romanticism).¹² His dedication to art history and his knowledge of European and Catalan architecture were the reason why the point of departure of many of the buildings he designed displayed the mediaevalisms which were developed in the second half of the 19th century.

The Casaramona factory was built between 1909 and 1912 by the cotton industrialist Casimir Casaramona i Puigercós. It opened in 1913 and the Barcelona Town Hall awarded it the prize in a competition of artistic buildings that it held each year. Similar to the Batlló factory discussed above, once the Casaramona factory was shuttered (it had to close in 1920 after a general strike), it started to be used as a stable and fleet garage of the national police. Later (2002) it became the headquarters of CaixaForum, a cultural facility owned by the former bank Caixa de Pensions per a la Vellesa i d’Estalvis. The factory complex is made up of three contiguous rectangular

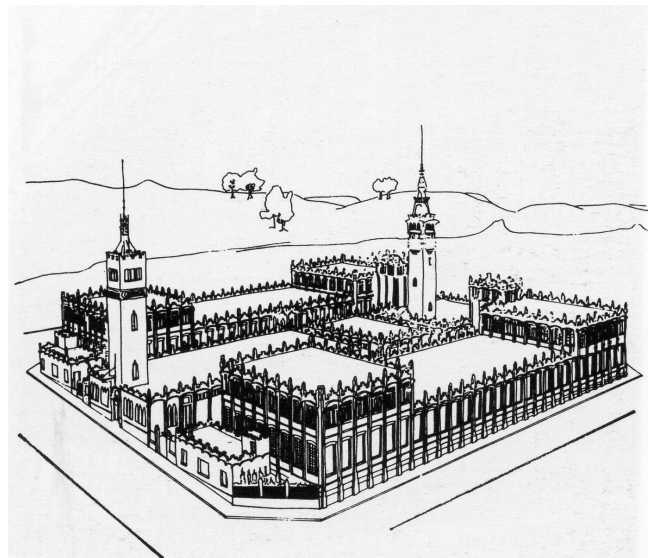


FIGURE 2. Barcelona. Casaramona Factory. Designed by Josep Puig i Cadafalch, architect, 1911.



FIGURE 3. Close-up of the Casaramona factory with one of the towers housing the water tanks. Photo: Ramon Manent.

buildings with markedly horizontal lines. The two main buildings run parallel to each other and are aligned with the opposite streets, and they consist of a low central body and two other symmetrical bodies on the ends which are twice as high as the central one, with the goal of creating an indoor space which optimises ventilation and light through a second row of windows. In the middle is another low building upon which rest the towers, whose verticality counterbalances the linearity of the buildings. All the buildings are separated by narrow walkways to make it easier to move goods while also serving as fire-breaks.

The design of the façades reflects a repetitive model of pilasters surmounted by staggered pinnacles, between which are stretches of the outside wall of the buildings which house the three-part windows framed by mullions and topped by arched segmental vaults crowned with merlons. This play of volumes and shapes, all built of exposed brick with the occasional use of stone and a few stuccoed walls, are the symbols of this industrial, urban architecture that is fully integrated into the Modernist language of the era yet with the unprecedented particularity of being a “factory-castle”. This appearance is reinforced by the existence of two prismatic towers which stand out from the buildings, which used to house the water tanks only used in the event of fires, since the factory operated on electrical energy and therefore did not need the smokestack that is usually associated with steam. The towers were built of exposed brick, and the only added decorative motifs are the wrought iron spikes which held up the clock tower, along with friezes around the perimeter made of polychrome glazed ceramic. The roofs of the buildings are flat in the Catalan style, but they have slight undulations to help the rainwater drain correctly. The interiors, which are open-plan and versa-

tile, can easily be adapted to new uses without losing the monumental identity of the façades, and the building has been classified as an Asset of National Cultural Interest (1976).¹³

The Aymerich, Amat i Jover factory of Terrassa

Terrassa, a city located 34 km from Barcelona and the capital of the county of Vallès Occidental, was one of the most important industrial hubs in Catalonia in the late 19th and early 20th centuries. Outside the walled area of the mediaeval city, a generous new district was built in the heart of the city’s expansion whose blocks housed a mixture of residential buildings, a wide array of public facilities and huge numbers of factories and steam mills, most of them devoted to the textile industry. Many of these factories, which became obsolete in the 1970s and 1980s and were in danger of being torn down, were added to the Terrassa Town Hall’s Architectural Heritage Catalogue and are currently used for cultural purposes, which allows their most significant architectural features to be left intact after being restored and opened to the public.

In this sense, the former Aymerich, Amat i Jover factory or steam mill is one of the most successful and famous landmarks in Catalonia. It was purchased (1983) by the Generalitat de Catalunya and turned into the headquarters of the Museu de la Ciència i de la Tècnica de Catalunya (Museum of Science and Technology of Terrassa)¹⁴ after overcoming obstacles that were leading to its disappearance (in fact, by the time it was saved by the residents, both ends of the very long building that made up the industrial complex had already been mutilated).¹⁵ It was built between 1906 and 1909 in the peculiar Modernist language of the architect Lluís Muncunill i Parellada (Fals, 1868 - Terrassa, 1931). Specialising in woollen fabrics, where the entire manufacturing process could be performed, it is a single-storey factory that occupied a plot of land measuring 11,000 m².¹⁶

Its main entrance is at number 270 Rambla d’Ègara, and one entered a courtyard through the one-storey entrance pavilion with a monumental entrance which was part of the wall around the premises. The coal bunkers were buried underground and the water reservoirs, no longer there today, and steam smokestack were all located in this courtyard. Across from the entrance is the main building, the most representative one from the urban design standpoint. It consists of three aligned and symmetrically laid out bodies. The central building is the equivalent of two storeys tall and has a monumental staircase with two sets of steps on either side that meet in the middle and three large openings with a centred door; two one-storey wings come off of either side of it.

The central body has a room clad in glazed ceramic which housed the steam engine, the reason for the elevation of the courtyard and two side wings, one of which led directly into the loom area. This entire main building was constructed with exposed brick and covered with segmental timbered vaults which form undulating vol-



FIGURE 4. Interior of the Aymerich, Amat i Jover factory. Photo: Jaume Orpinell, 1990.

umes traced by moulded cornices. The four vaults of the main body are laid out parallel to the gable wall, while the three vaults on each wing are laid out perpendicular. The windows and doors have jambs and segmental arches decorated with patterned brick archivolts, a decorative but also structural device that the architect Muncunill cultivated in practically all of his buildings, both

industrial and residential, whose conceptual inspiration had come from Antoni Gaudí. The bays were expressed outside by the undulating wave of the roof, and at the centre of each gable wall was a round bull's eye made of the same characteristic materials as the windows. Next to the southern part of the pavilion is the 42-metre tall brick smokestack. It has a round base reinforced with blind semicircular arches supporting the tapered shaft where the fumes escaped, which is topped with a two-stranded hood.

Behind the steam machinery building was the spacious manufacturing building, and here is where this factory's major innovation can be found: the structure of the roof, based on sheds laid out in a sawtooth pattern which allowed the natural light to be captured from above to illuminate the interiors. The inside was distributed into a host of bays separated by rows of cast-iron columns, 300 in total, a veritable forest of metallic trees which were manufactured in Barcelona's Nuevo Vulcano workshops. Arches rest on the columns in alternating parabolic and flattened shapes made of differing tile thicknesses placed flat, and the blind spandrels, also made of brick, directly supported the vaults tautened with iron struts which cover the building. On the outside, the sheds rhythmically succeed one another in a host of segmented arches and bell-shaped timbrel vaults. Originally, the vaults were plastered on the outside and painted white inside, while the northern face, which is sloped, was given a glass skylight held up by slim, vertical cast-iron rods. The outcome is a dynamic roof that plays both aesthetically and volu-

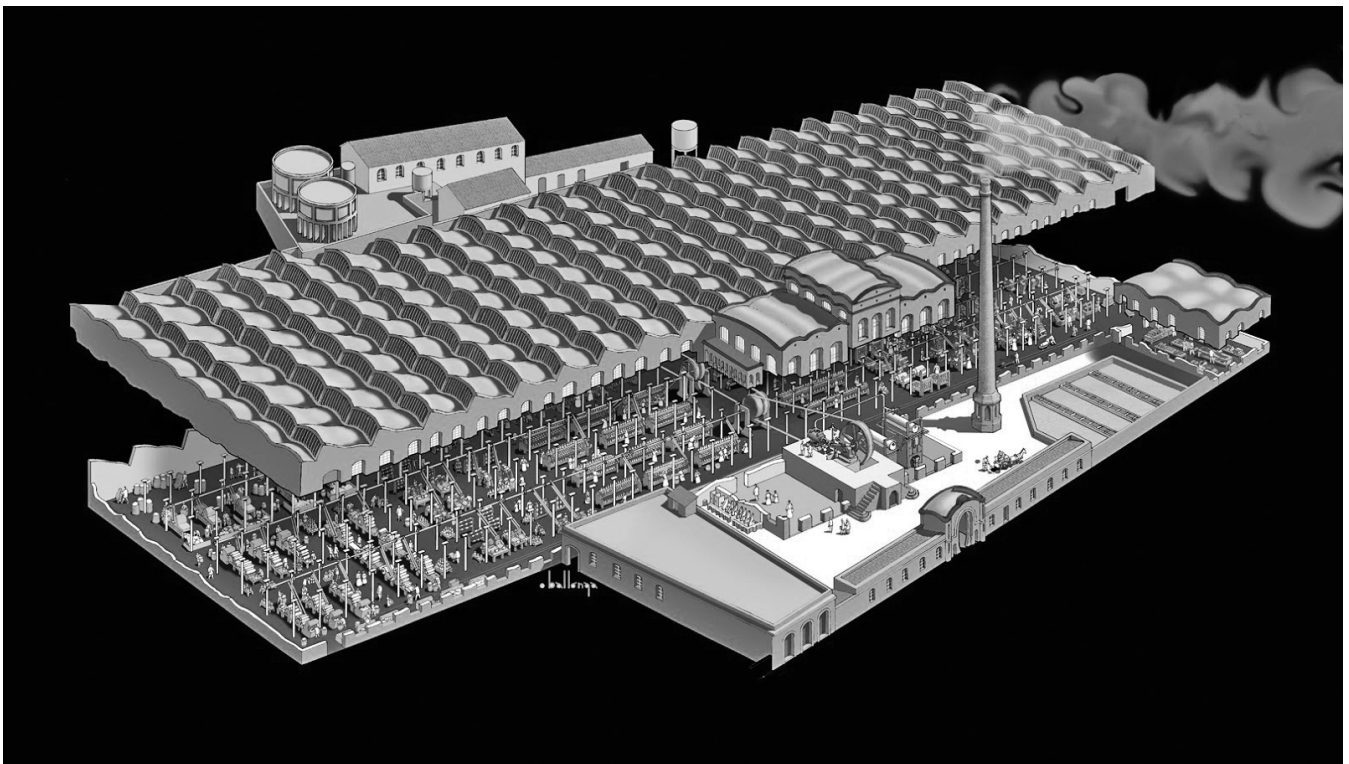


FIGURE 5. Cross-section of the Aymerich factory. Museu de la Ciència i de la Tècnica de Terrassa (Museum of Science and Technology of Terrassa). Drawing: Jordi Ballonga.

metrically with the vaults of the energy building at the entrance. The paint inside the vaults was mistakenly stripped during the restoration of the building in 1980-1990, and this meant the loss of the reflection caused by the immense natural brightness that penetrated down from the skylights and gave the building its unique feature, luminosity. Despite this, the Aymerich factory was given a worthy fate when it was turned into a museum which is known around the world not only for its displays but even more importantly for its typological, architectural and constructive uniqueness.¹⁷

Electricity and gas factories

Other representative examples of industrial Modernism in Barcelona are two factories which used to produce energy: La Central Catalana d'Electricitat, at number 12 Carrer de Vilanova, on the corner with Carrer de Roger de Flor in Barcelona's Fort Pienc neighbourhood halfway between Estació del Nord or Vilanova and the Arc de Triomf; and the Sociedad Catalana para el Alumbrado de Gas factory, which was located on the far north end of the Barceloneta neighbourhood, just near Ciutadella Park and the Maritime Section of the Barcelona's World Fair of 1888.

The former, the electricity factory, was built between 1896 and 1899 following the design by architect Pere Falqués i Urpí (Sant Andreu de Palomar, 1850 - Barcelona, 1916), the author of numerous public and private works and a civil servant in the Barcelona Town Hall. At first it consisted of two parallel buildings, one of which was occupied by the steam engine and five direct-current dynamos, and the other by the steam boilers. A third building, the main one, which ran perpendicular to the first two and parallel to the street, was used as the lobby, offices and homes of the plant managers. The structure is made of riveted iron with compound piers and lattice girders.¹⁸

The façade of the building that still stands today, which is the outcome of several enlargements and changes in use, is at an obtuse angle. The chamfer is emphasised by the main volume, which is off-centre and asymmetrical compared to the whole. It has one half-basement and five storeys which contain the entrance located right on the corner, and it is surmounted by a staggered pediment. This body has two side wings (the one on Carrer de Roger de Flor was built in 1910 by the architect Telm Fernández i Janot) which have a half-basement and three storeys. Both the door and the socle are made of stone from Montjuïc (the door with glazed ceramic enlargements), and the rest of the walls are exposed brick. The expressive force of the façade stems from the regular sequence of its compositional elements based on alternating double-high pilasters and windows, the latter reinforced with iron rods attached with rivets that outline the shape of the patterned brick arches. A running frieze of gemel windows running along the third storey provides homogeneity and coherence to the entire composition. As a whole it exudes

a modern concept of architecture verging on brutalist, with a few historicist connotations interpreted and designed by Falqués with creative license within the Modernist language, along with constructive and functional rationality. The slender smokestack of the electrical plant was torn down in 1961. However, the building is listed in the Architectural Heritage Catalogue of the Barcelona Town Hall and was restored and repurposed into offices between 1977 and 1980.

The second factory, called Catalana de Gas since 1912, is perhaps the most Modernist of the designs by the architect Josep Domènech i Estapà (Tarragona, 1858 - Cabrera de Mar, 1917). It was built between 1905 and 1907 on commission from the Sociedad Catalana para el Alumbrado de Gas, which had been founded in 1843. The factory was originally a large industrial complex made up of a series of buildings. The company had started an expansion process at the turn of the 20th century as it shifted its activity towards the electrical sector, and this was captured in architecture in the construction of a variety of buildings for different purposes, along with towers and smokestacks, and a wall around the perimeter which enclosed the premises as if it were a walled city, a perfectly urbanised industrial city.

In these projects, Domènech i Estapà boasted a mastery of the languages of iron and Modernist architecture, and he merged them in a harmonious eclecticism. The buildings looked like little palaces of industry with common stylistic features and building materials, yet each was formally resolved in a unique way. The white walls of the stuccoed facades stood out amidst mouldings, arches, impostes, cornices, rounded pediments, pilasters, doors and windows made of red brick. The variety of materials in each building broke up the traditional, standardised monotony of factory constructions. Each building had a different purpose, and their outer appearances were equally distinct: the chemical purifier building, the machinery and boiler building, the meter building, the calcium sulphate factory, the buildings used to refrigerate and extract foreign products from the gas, and the cleaning room. The interior structure was made of metal, with cast-iron columns and roofs with small vaults over iron beams in some cases.

During the 1908 edition of architecture prizes awarded by the Barcelona Town Hall, the factory earned an honourable mention, as it was deemed a colossal temple to industry. In 1989, most of the buildings in the complex were torn down in order to create a city park. The only thing still standing from the original complex is the Torre de l'Aigua (Water Tower, from 1905), which has now been restored but originally contained the water tank to cool the gas, and the management office building (from 1907), where Fàbrica del Sol moved in 2009, the home to an environmental education centre where renewable energies are promoted (the Barcelona Sustainable Resource Centre). The steel structure of the gasometer, built by Claudi Gil Serra in 1868, also remains from the early days.¹⁹

THE CONSTRUCTIONS AT THE TEXTILE COLONIES: THE RURAL MODEL

In Catalonia, the move of urban textile industries to the countryside after the second half of the 19th century had a political, economic and social backdrop. Political upheaval and conflicts with workers played a role, as they forced the bourgeoisie to move away from the cities. Once again, the model followed the English strategy, even though the phenomenon had taken place in England during the 18th century for different reasons. After a series of attacks and murders in the urban factories owned by the Catalan industrialists, many chose to move to the countryside by rivers (primarily the Llobregat and its tributary, the Cardener, and the Ter) to take advantage of the hydraulic energy provided by the river flows via turbines.²⁰

They did not stop at building factories but instead erected veritable industrial towns – the colonies – which were self-enclosed, far from the urban nuclei and provided an entire range of social, cultural and religious services (schools, churches, company stores and consumer cooperatives, medical services, athenaeums and libraries). They also provided housing of different categories and hierarchies for both the owners – which were sometimes verging on little palaces or summer homes which were architecturally distinct from the other buildings – and for the heads of the factories, as well as for the workers and their families.²¹ Everything had to be controlled, and the operation of the colonies took on a moralising, paternalistic tone: the owner became the guardian who watched over a displaced population that was kept away from the ideological influence of the urban proletariat, a workforce that was willing to increase and improve production without disturbances or strikes. The colonies were designed to resemble small, newly-built cities (even though their urban planning concept was not always clear) with the factory building set away from the residential area and public facilities. Streets and squares, as well as gardens, parks with groves and playing fields integrated into the factory premises served as the communal gathering places of the new residents.²² Plus, the workers had the possibility of combining their jobs in the factory with farming the land and cultivating the small vegetable patches that some of the homes had.

The first industrial colonies were built in the Catalan countryside in the 1840s and 1850s. The factories were built first, followed by the “urban-rural” nuclei. By the late 19th century, the proliferation of colonies was an entrenched fact, and they offered an increasing number of services, while the quality of the homes also rose. Perhaps the most paradigmatic case, although it was not the first one created, was Colònia Güell. Situated parallel to the Right Llobregat Canal (built between 1855 and 1865), very near the Llobregat River itself to the south of the town of Sant Boi de Llobregat (although years later it would be annexed into the town of Santa Coloma de Cervelló), it enjoyed a perfect location for both industrial

manufacturing and farming. However, probably the most important factor is that it was based on an unprecedented urban planning project in Catalonia.

The industrialist Eusebi Güell i Bacigalupi (Barcelona, 1846-1918) was the one who brought the idea to fruition, and he and the engineer Ferran Alsina i Parellada laid the foundations of the factory. The general blueprints of the colony were commissioned to the most prestigious architect in the country, Antoni Gaudí i Cornet (Reus-Riudoms, 1852 - Barcelona, 1926). Eusebi Güell had inherited the Can Soler de la Torre estate from his father, Joan Güell i Ferrer (Torredembarra, 1800 - Barcelona, 1872),²³ who had purchased it in 1860. It contained a country home and extensive farmlands. He had also purchased a few plots of land on the river banks, between the river and the road, where horticultural products were farmed. The creation of Colònia Güell reflected Joan Güell’s move of what was known as Vapor Vell, in the neighbourhood of Sants (Barcelona), which produced corduroy, velvet and cotton, to the countryside in 1840. The urbanisation project of Can Soler estate called for the installation of a factory along with other factory buildings alongside it and the smokestack, which became the “ideal model of the multi-storey factory”,²⁴ precisely at the entrance to the estate and next to the road, which opened in 1981. In parallel, the project also planned for the construction of the colony itself, which was encircled by a solid wall along with the factory.

In terms of its urban planning, it was envisioned as an orthogonal grid of streets built around two main axes laid out in an L-shape. Beyond the factory was a playing field and the old estate house. The residential area was located on either side of the main arteries, which led to secondary streets. Right in the middle of the main avenue was a small rectangular square which was the home to the colony’s most important facilities, although some were also located on the streets running parallel to the central axis. On the far north side of this artery is the school, which is surrounded by a pine grove. The church was built in another small grove on the side opposite to the factory at the top of a hill. Most of the buildings, including the factories, were built with cast iron and beams and wood platforms, along with facades made of exposed brick, a material which yielded extraordinarily beautiful shapes, textures and transparencies of trellises.²⁵

The colony was laid out in precise zones with tree-lined avenues and was equipped with a school, an inn, a hospital, shops, single-family homes – those meant for the doctor, director and other senior managers at the factory and colony were particularly aesthetically appealing – and attached single-family homes with simple construction and a small vegetable patch in the back for the workers. For the urban planning project and the construction of the buildings, Gaudí worked with his helpers Francesc Berenguer i Mestres, Joan Rubió i Bellver and Josep Canaleta, and he himself directly supervised the project and oversaw construction of the church he had planned, Sagrat

Cor. Even though only its lower nave was ultimately built (popularly called the crypt), UNESCO declared it a Human Heritage Site.²⁶ In the words of Àngel Miralda, Güell and Gaudí, the main spearheads behind the colony, were the “industrialist with experience, a consolidated fortune and a particular combination of enlightenment and philanthropy, and the best architect, capable of formalising his reasonable utopia. Broad views and formal quality teamed up in the construction of an urban planning model that at the time was both progressive and cultivated: the low-density working-class suburb in a rural setting. Güell’s main contribution was his awareness of urban design as an instrument of social control.”²⁷

THE CONSTRUCTIONS OF PRIVATE VITICULTURISTS: WINERIES AND DISTILLERIES

The agricultural industry was not left behind in the quest to improve its products and the desire to attain symbolic representativeness through architecture. According to Josep Maria Montaner, “works like the Güell winery and the Codorniu cava winery, along with others like the Casaramona factory and Colònia Güell, within the rationalistic renaissance which emerged in the late 19th century, demonstrate that industrial complexes are what can best recreate mediaeval citadels, microcosms of Catalan industry which are reminiscent of walled cities, monasteries and Gothic cathedrals as the mythical origin of Catalan art.”²⁸ The road to achieving this might have been long compared to the progress in architecture in the textile industry, but the results were outstanding. Oftentimes the textile manufacturers themselves purchased large rural estates to develop a parallel economic activity, and there they built the wineries, some of which have remained for posterity as prime samples of our agricultural architectural heritage. Eusebi Güell was one of those industrialists who combined farming with industry, trade, finances, mining, Portland cement manufacturing and a host of other activities.²⁹

In Catalonia, “the area where wineries, wine storage, distilleries and cellars were built encompasses a broad swath of the region which follows the Mediterranean coastline and the valleys, basins and plains which connect it with the inland regions, from Terres de l’Ebre to L’Empordà and inland to the Pla de Lleida”.³⁰ Viticulture appeared in Catalonia in the 6th century BC and still exists today, although it has gone through periods of both crisis and major expansion, such as the one just prior to the phylloxera outbreak from Europe. Phylloxera penetrated Catalonia via L’Empordà in 1879, but it did not reach the counties of Garraf and Penedès until 1887.³¹

Cellers Güell

The most important construction on the Mediterranean coastline (32 km south of Barcelona), because of its unexpected presence on a bend in the motorway and its un-

sual architecture, is located in the former district of Garraf on the massif of the same name within the township of Sitges. With his extraordinary nose for business, Eusebi Güell had purchased the Garraf building with its watch tower, adjacent home and lands in 1872, shortly before the motorway (1873) and the railway line running along the coast from Barcelona to Valls (1878 and 1881) were completed, which bounded it on the north and south, respectively. Furthermore, the La Falconera tunnel (carved into an impressive cliff overlooking the sea), where the train ran, was opened on the 31st of August 1880. These means of transport made it easier to continue growing grapevines there and profit from the property in other ways, such as the attempt to find water in the underground river of La Falconera and sell it in Barcelona, which was not successful, and the limestone quarries on the Garraf massif, with which Palau Güell and the crypt at Colònia Güell were built, both designed by Gaudí.

Eusebi Güell used and expanded the former home and an adjacent cellar on the north side soon after he purchased the estate; he commissioned the builder Joaquim Sitjas i Pausas to expand and remodel the building. It is a traditional structure with three storeys. The first storey was covered with nine domical vaults made with tiles and supported on quadrangular stone pillars. The second storey echoes the pillar structure, but this time they support arcades and wooden beams and a two-sloped ceiling. The first two storeys were used for the winery while the upper one stored fruit and housed the workers. Wine was crafted and bottled in Garraf and sold in Barcelona’s Palau Güell. It was also exported to Cuba and was imbibed on the ships owned by the *Compañía Trasatlántica*. When the phylloxera plague reached the Garraf region, Eusebi Güell had his vineyards replanted with vines from American stock.

However, the most interesting part of the complex is the building designed by Antoni Gaudí with the assistance of his worker Francesc Berenguer i Mestres (Reus, 1866-1914). Back in 1882, Eusebi Güell had commissioned Gaudí to design a hunting pavilion for Garraf (which was never built), and in 1895 he commissioned him to design two pavilions, which ultimately materialised in two buildings boasting impressive architecture. Despite the fact that some of Gaudí’s biographers attribute the design of the buildings to Berenguer, Gaudí himself told the architect Amós Salvador that the designs were his own.³² In fact, in Gaudí’s hands these two pavilions were quite different in size. The first became a two-storey concierge pavilion on the edge of the motorway built with stone from Garraf and exposed brick; it has a mediaevalist feel and a top that is clearly defensive in appearance, with embrasures and merlets, along with a parabolic brick arcade with a rotating wrought-iron door which led into the estate. Here is where we believe that Berenguer, who was 29 years old at the time, played a more prominent role, at least in supervising the construction. The second pavilion was located on the eastern side of the estate and was separated from the first

one by a walkway that followed the old road running along the coasts of Garraf. Built with local rough-cut stone, it was joined to the home by a balanced arch spanning the old road.

The structure has five storeys, two of them underground measuring 300 m² each, which housed the cellars with the wine bottles, and three above-ground of decreasing size to accommodate the shape of a steeply sloped roof, which inspired some authors to dub it a “roof with no building”, a “tent” or a “ship with the keel facing upward”. Today we would say that it is like an architectural metaphor of the natural landscape in which it was ensconced: like yet another steep peak in the mountains of Garraf, while also representing a sailboat on the seascape. The ground floor was used as a carport and storage room, the middle storey was the Güell family’s seasonal home, and the upper storey housed a chapel. This chapel could be reached via an outdoor staircase that led to a porticoed lookout point of inclined pillars which served as the atrium of the chapel, whose interior space was resolved with a somewhat steep parabolic vault. The cast goldwork in the presbytery is magnificent. On the building’s roof ridge there were two chimneys, the northern one tapered and the southern one in a pyramidal shape reminiscent of a wine or champagne glass. In the centre is a bell gable from which the “Isabel” is suspended, the nickname of a bell crafted in 1897 in honour of Güell’s wife, Isabel López Bru. The building has been used as a restaurant since 1980.

Catalan champagne production: The Codorniu-Raventós estates

The other large privately-owned wine-producing complex is the Codorniu (1895-1915) winery, which was declared a National Historical-Artistic Monument in 1976. It is located on the outskirts of Sant Sadurní d’Anoia (Alt Penedès) in the midst of vineyards within premises encircled by a stone wall clad with glass shards (the *trencadís* technique) from champagne bottles. The Codorniu and Raventós families have a longstanding tradition as vintners in the county; they were joined through marriage in the 17th century: Anna Codorniu married Miquel Raventós in 1659, and their descendants in the 19th century played a key role in bringing Catalan sparkling wine to the Penedès region. In 1872, Josep Raventós i Fatjó and others created a bubbly wine following the French method but using three local grape varieties (Macabeu, Xarel·lo and Parellada), and after 1885 Manuel Raventós i Domènech, Josep’s son, decided to solely produce Catalan champagne. In ten years, his company became the leader in its sector in Spain and one of the most important in the world.

In 1895, he came up with the idea of creating a large cava complex around the old Codorniu estate, and he commissioned architect Josep Puig i Cadafalch to design a series of buildings, both industrial and residential, and to urbanise the gardens around them. Construction took 20 years. The set of historicist Modernist buildings includes



FIGURE 6. Sant Sadurní d’Anoia. Caves Codorniu. Photo: Ramon Manent.

the owners’ stately home, which stands out for its almost cubic volume and the cylindrical tower soaring over the roof at one corner of the house; the Expedition Hall, a room where Puig i Cadafalch used Gaudi’s parabolic diaphragm arches for the first time, to outstanding results; and the Porxo de Premses (Grape Press Porch), the Celler Gran (Large Cellar) and the underground cellars, a complex built in a staggered fashion to hug the slope in the Anoia River valley. The Porxo is used for the Museu d’Eines i Aparells, a museum displaying the tools used to make Catalan champagne, and its façade, which faces the garden, is made of a series of pointed brick arches crowned by stepped gables whose fronts are clad in glass *trencadís*, also made of champagne bottles just like the wall enclosing the premises. The interior features timbered vaults supported by round arches resting on pillars. On the other side is the Celler Gran, located on a lower level, which receives natural light through apertures on the upper part of the wall facing the river. Finally, there are the underground cellars, divided into several levels, each measuring 500 x 200 metres in area, with three kilometres of corridors.³³

The alcohol distilleries

Also called *fassinies* in some regions of Catalonia, after the 18th century these distilleries were primarily used to produce spirits, a high-proof alcoholic drink which manufacturers began to regularly export to the Americas after 1756, when free trade between Catalonia and the Indies was established. These factories were not particularly well known for their architecture, which retained the functional features of traditional architecture without any artistic pretensions.³⁴ A few examples built in the first quarter of the 20th century are the exceptions, as some owners decided to commission experienced, renowned architects to design their buildings, some of them Modernist (such as the Regàs distillery from 1907-1908 and the Gerunda distillery from 1911, in Girona) and others verging on Art Deco (such as the Vilajuiga marc liqueur distillery from 1920-1922 in the Alt Empordà, built for the Federació de Sindicats de l’Empordà by the architect Cèsar Martinell i

Brunet), while others were even neo-mediaeval in style (such as the Mollfulleda or Fàbrica Calisay distilleries in the town of Arenys de Mar, in the Maresme, a set of buildings which were originally a 16th-century flour mill called Molí de Dalt which were built between 1917 and 1956 with successive interventions by the builder Joan Dotras i Manyà and the architects Joan Rubió i Bellver and Cèsar Martinell i Brunet).³⁵

The Regàs and Gerunda distilleries were designed by the architect Enric Catà i Catà (Sant Feliu de Llobregat, 1878 - Barcelona, 1937) and are integrated into the urban grid of the Pont Major neighbourhood next to the Ter River. Except for the differences necessitated by their different uses, as they manufacture different spirits, these buildings share the same distinctive way their façades are formally treated: both are organised symmetrically around a central axis which is emphasised by gables or acroteria which stand out from the line of the cornice, into which large windows providing light inside are carved. On the facades, skilfully carved stone is combined in soles with upper walls made of exposed brick (in the Regàs distillery) or with arches, jambs and cornices (in the Gerunda distillery). The interiors are treated and decorated differently. While in the Regàs distillery the walls are clad in white and green checkerboard tile and the ceilings are made of wooden beams and vaults painted with grape and fish motifs, in the Gerunda distillery the shop at the entrance has walls clad in fire-pressed stucco which imitates different qualities of marble, while the ceilings have vaults covered in the same stucco on metal girders.³⁶

THE CONSTRUCTIONS OF THE AGRICULTURAL SYNDICATES: WINERIES, OLIVE MILLS AND FLOUR MILLS

In the first decade of the 20th century, the agricultural cooperative movement felt the need to create spaces worthy of and appropriate for the production of wine, which signalled a true shift in its social and economic revival. As we have seen above, the large private vintners, such as Raventós and Güell, had already embarked upon a process in which they enlisted the designs of top-notch architects (Gaudí and Puig i Cadafalch, as well as Joan Rubió i Bellver in the Raventós de Raïmat winery in Lleida, started in 1916) which was yielding positive results and was helping to give their products cachet. This example was emulated by the cooperativists as they forged ahead and built their own wineries, taking an initiative with no turning back which in the second decade of the century, with the support of the Mancomunitat de Catalunya, would be manifested in the construction of magnificent agricultural buildings which went down in history as “signature architecture”. Young architects were commissioned, such as Jeroni Martorell i Terrats (Barcelona, 1876-1951), who built the first cooperative winery in 1907 for the Sindicat Vitivinícola d’Alella, in the Maresme. Later Pere Domène-

ch i Roura, Cèsar Martinell and Bernardí Martorell, who had been trained by the aforementioned masters, were in charge of designs for wineries which would soon be dubbed “cathedrals of wine”. And thus began the monumentalisation of the countryside with civil, rural buildings sponsored by modernised, enterprising farmers.

The factors that came into play in this process can be summarised in several points: the phylloxera attack (France, 1863; Iberian Peninsula, 1870s; Catalonia, 1879); the Spanish government’s enactment of the Anti-Phylloxera Law in 1878; the social conflicts in Catalonia (*rabassa morta* [stump land] contracts, between peasants and landowners); the Law on Associations (1887) and the first agricultural associations, with the birth of consumer cooperatives; the Law on Agricultural Syndicates from 1906, which in Catalonia resulted in the founding of what were popularly known as “risk syndicates” and “poor folks’ syndicates”; and the instatement of the Mancomunitat de Catalunya (in place from 1914 to 1923).

The cooperatives’ wineries and oil mills

During its brief life of political, administrative, social and cultural action, the Mancomunitat spearheaded the reform of the Catalan countryside and agricultural syndication by establishing credits with aid to benefit wine-making cooperatives, either directly or through banks and rural savings and loans. Its slogan was “A syndicate in every town and an agricultural federation in every county”. It also assisted with the introduction of better technologies and services as well as the education needed by the rural population to increase agricultural production yields. The impetus received by Catalan farmers during this period of associationism translated into the construction of 75 wine-making cooperatives in Catalonia between 1919 and 1923, out of a total of 90 in Spain, meaning that 70% were on Catalan soil.

The technological improvements affected both production and agricultural buildings. The architects brought new building types which culminated in the appearance of architectures in the outskirts of small towns made up of one or more large buildings whose remote referents were country estates and factories, but with their own functional and material needs which would define the unique features of agricultural architecture within the world of cooperativism.³⁷

These wineries owned by the agricultural syndicates, which still emerged under the stylistic influence of Modernism, were built during the age of Noucentisme, and their architecture is a reflection of the evolution in the construction systems and formal language. Pere Domènech i Roura (Barcelona, 1881 - Lleida, 1962; the son of architect Lluís Domènech i Montaner) designed the winery of the Sindicat Agrícola i Caixa Rural of L’Espluga de Francolí (1912-1913), which paved the way for those built afterward.³⁸ He designed two adjacent parallel buildings which had a basilica-like floorplan (and were later enlarged with a third) and one cross-wise building with a



FIGURE 7. El Pinell de Brai. Winery of the Sindicat Agrícola. View of the interior with a structure of balanced arches. 1918.

structure made of cruciform pillars which supported the diaphragm arches that shaped the interior spaces (inspired by the halls of the neighbouring Cistercian monastery of Poblet) and with formerets separating them, the former with concrete reinforced with two cross-wise layers of brick, and the latter made of rows of timber arches and twisted arches.³⁹ They are in the shape of Gothic arches with openwork spirals, also made of exposed brick, but enclosed with round arches and support the usual roof made of wood, ceramic tile and terracotta roof tiles. The vats, which are accessible from the upper part through aerial walkways, rest on four brick legs which generate a splayed arch and allow for ventilation, cleaning and movement around them.

In the series of wineries he designed between 1917 and 1922, Cèsar Martinell i Brunet (Valls, 1888 - Barcelona, 1973), a disciple and biographer of Antoni Gaudí, streamlined the forms and the technology with the assistance of engineers and oenologists from the Mancomunitat de Catalunya, motivated by the principles of economy, utility and beauty. Following the model of L'Espluga de Francolí, he adopted the basilica shape of the buildings as the ideal solution for making wine and oil (almost all his agricultural

constructions produced both). His contributions to improving the quality of both the buildings and the products can be summarised in the following ingredients:⁴⁰

- Separation of the underground tanks lined up in a row through empty spaces to insulate the transmission of temperatures between them.

- Construction of these empty spaces using vertical brick arches, while the vats were made of reinforced concrete.

- Ventilation of the empty spaces with baked clay tubes to facilitate the circulation of both warm and cool air.

- Maximum usable built capacity in the minimum volume. Underground tanks and vats on the ground floor laid out in rows with walkways separating them.

- Openings on the facades at ground level with grilles to allow the gases to escape.

- Austerity in the choice of building materials (always local: local stone for the building socles, brick on the rest of the façade and on the openings and internal structures, tile, adobe, etc.).

- Weight-bearing structure of parabolic (balanced) arches built with differing thicknesses of tile and brick, sometimes patterned.

—Sloped roofs made with rafters or wooden beams and roof tiles, or with timbrel vaults two or three layers of brick thick with tile (called “eggshell” because of their lightness and shape).

—Harmony with the landscape and respect for the urban image of the towns where they are located (almost 50 of them).

The wineries of the agricultural syndicates of Rocafort de Queralt, Barberà de la Conca, Vila-rodonà and Montblanc (in the county of Conca de Barberà), and those of Pinell de Brai and Gandesa (in the county of Terra Alta), Nulles (Alt Camp), Falset and Cornudella de Montsant (Priorat) and Sant Cugat del Vallès (Vallès Occidental), along with so many others, were built following these premises.⁴¹

Rocafort de Queralt, Pinell de Brai and Gandesa are perhaps the wineries which are embellished with added decoration, such as the friezes or panels of glazed polychrome ceramic which decorate the artistic facades (the Noucentista painter and potter Xavier Nogués made the decorative tiles in Pinell de Brai and Gandesa). However, their most important feature is their structure of balanced brick arches which Martinell used to lower construction costs, since in the years after World War I the used of reinforced concrete was unfeasible in Catalonia because of the meagre economy of the syndicates. Thus, the princi-

ple of economy was paired with beauty, because the spaces created with this construction system allowed buildings with large spans (the distance between the springing of arches) to be covered, with the consequent increase in production capacity, spaciousness, ventilation, movement between vats and wine presses and austerity. Furthermore, in Gandesa and Sant Cugat (as well as in the grain storage facility in Sant Guim de Freixenet, in La Segarra), the buildings were designed as homogenous masonry structures covered with timbrel vaults over balanced arches distributed at different heights, with extraordinarily beautiful volumetric results. The majority of these buildings have been protected or declared Assets of National Cultural Interest, and most of them still make wine and oil, even though some areas have been turned into shops and storage rooms, and others into museums. Furthermore, they are open to the public after having been restored by the Generalitat de Catalunya with financing from the Fundació La Caixa.

The flour mills of Girona and Cervera

We should finally mention a kind of agricultural industrial architecture that has also gone down in the history of Catalan architecture: flour mills. We have two beautiful Modernist examples: the Farinera Teixidor (1910-1911,



FIGURE 8. Girona. Teixidor flour mill, designed by Rafael Masó from 1910 to 1912.



FIGURE 9. Flour mill of the Sindicat Agrícola of Cervera and its county. Close-up of the façade and the water reservoir. Photo: R. Lacuesta, 2012.

expanded in 1915-1923), at number 42 Carrer de Santa Eugènia in the city of Girona, the work of architect Rafael Masó i Valentí (Girona, 1880-1935), and the Sindicat Agrícola flour mill in Cervera (1920-1922) designed by Cèsar Martinell.

The Farinera Teixidor is an industrial complex that was initially made up of two buildings joined by a bridge, one used as the owner's home and the other as offices. They led to an interior corridor where the storage rooms and workshops were housed, with a tower in the background, which was the heart of the factory. In 1923 it was expanded with two symmetrical storage wings attached to the office building, which still stand aligned with both original buildings. What stands out in the entire complex is the silhouette of rounded volumes and the chiaroscuro effect of the meaty, almost sculptural masses of majolica; the wrought iron at the entrance and windows; the amazing treatment of the arches that shape the coping of the building, based on ceramic tiles specifically designed by Masó in a Gaudí-inspired style; and the uniform pinkish colour of the walls combined with the white of the glazed

ceramics, which alludes to the colour of flour and is a symbol representing the factory. The building was restored between 1993 and 2000 by the architect Arcadi Pla to house the headquarters of the newspaper *El Punt*. Very nearby, on the same street, the manufacturer Teixidor also commissioned Masó to design a multi-storey building of rental homes known as La Casa de la Punxa (1918-1922), which stands out because of its tapered tower on the corner which ends in two steeples. This building has become the headquarters of the Col·legi d'Aparelladors de Girona, and the Teixidor urbanisation (1928-1929), a series of freestanding affordable single-family homes, which were torn down in 1974.⁴² These works reveal Masó's influence from the Scottish architect Charles R. Mackintosh and Central European architecture, especially the Viennese Secession.

The flour mill of Cervera reflects a project which, as Martinell says, looks more like a "citizen factory than a rural building".⁴³ The building is made up of three different bodies at differing heights laid out in a U-shape, with one of the ends bending inward. The façades combine stretches of stuccoed and smooth walls with a sequence of pilasters made of perfectly square ashlar which are closed on the upper part with semicircular arches, and in the places where the building is taller the stone fascia become a frieze with triple arcades made of exposed brick punctured with small openings above which runs a moulded cornice, also made of brick. The symbolic feature of the building is the water reservoir resting atop the tallest part of the flour mill, like a tower or lamppost built with brick arches; it is rectangular in shape with the ends like semi-circular exedras and is covered with a semi-spherical dome flanked by two more quarter-spherical domes crowned by an iron steeple that holds the spotlights. Out of use for years and in danger of being torn down, fortunately the flour mill was protected when the Generalitat de Catalunya declared it an Asset of National Cultural Interest in 2002.

TO CONCLUDE

The fate of Catalan industrial architecture has varied widely; many factory buildings have been torn down after being abandoned as obsolete, as well as from outsourcing, the crisis in the textile sector and other reasons, and the lands have been prime sites of real estate speculation. However, numerous buildings have been saved, perhaps the most representative ones, and, in general, many of their smokestacks remain standing, especially in the factories which manufactured textiles and other goods, as a silent tribute to a prosperous past. Of those that have survived, the public administration and several financial and cultural institutions have taken charge of conserving and adapting them to uses other than the ones for which they were built, leaving cultural assets and tourist sites whose lives will, at the very least, be lengthened.

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- [14] The museum design was devised by the engineer and museum director Eusebi Casanelles Rahola between 1983 and 2013, and the restoration of the building (1983-1984) was planned and carried out by the architects Ramon M. Puig Andreu and Carles Escudé. In 1988, the architects Joan Margarit and Carles Buxadé refurbished the museum.
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- [16] Conxa BAYÓ I SOLER. “La indústria tèxtil. Els vapors”. In: Assumpció FELIU TORRAS (coord.). *Cent elements del Patrimoni Industrial a Catalunya*. Associació del Museu de la Ciència i de la Tècnica i d’Arqueologia Industrial de Catalunya and Lunwerg, Barcelona 2002, pp. 48-54.
- [17] To learn about the history and characteristics of the output of the Aymerich, Amat i Jover factory, visit the museum’s website: *Terrassa i el vapor Aymerich, Amat i Jover. Un procés tecnològic i humà: el tèxtil*. <www.mn-actec.cat>; also: *Dossier Vapor Aymerich, Amat i Jover de Terrassa* <http://www.xtec.cat/~agonza17/arxius/vapor_aymaric.pdf>; *Museu de la Ciència i de la Tècnica de Catalunya*. <<https://es.m.wikipedia.org>>; Raquel LACUESTA and Antoni GONZÁLEZ. *Guia de arquitectura modernista en Cataluña*. 3rd ed. Gustavo Gili, Barcelona 1997, p. 167.
- [18] Antoni LOZOYA and Pere FOCHS. *Central Vilanova*. Hidroeléctrica de Cataluña, Barcelona 1982, p. 80. Citation included in J. CORREDOR-MATHEOS and Josep Maria MONTANER. *Arquitectura industrial..., op. cit.*, p. 57.
- [19] Excerpted from Raquel LACUESTA CONTRERAS and Xavier GONZÁLEZ TORAN. *El Modernisme perdut. La Barcelona antiga*. Vol. I. Base, Barcelona 2013, pp. 41 and 48-49.
- [20] The course of the Llobregat River and the industries built alongside it have been studied by Joaquim CASTELLS and Màrius CAROL. *El Llobregat, un camí d’aigua*. Diputació de Barcelona and Lunwerg, Barcelona 1992; Llorenç FERRER, Jordi PIÑERO and Rosa SERRA. *El Llobregat, ner-*

- vi de Catalunya*. Diputació de Barcelona, Àmbit de Recerques del Berguedà, Centre d'Estudis del Bages and Angle, Manresa 1997; Rosa SERRA. "Industrial colonies in Catalonia". *Catalan Historical Review*, no. 4 (2011), pp. 101-120. Catalan version: *Les colònies industrials a Catalunya*, pp. 241-255.
- [21] The Museu de la Ciència i de la Tècnica de Catalunya held workshops and a conference in 2002 and 2005, respectively, which examined the topic of the industrial colonies. See the proceedings at: Gràcia DOREL-FERRÉ (dir.). *Habitatge obrer i colònies industrials a la península ibèrica*. MNACTEC, 2008.
- [22] They were, in short, the measures proposed by Pere Felip Monlau in 1855 for the formation of the factory colonies. P. F. MONLAU and J. SALARICH. *Condiciones de vida y trabajo obrero en España a mediados del siglo XIX*. Anthropos, Barcelona 1984.
- [23] Jaume VICENS I VIVES and Montserrat LLORENS. *Industrials i polític (segle XIX)*. Vicens-Vives, Barcelona 1972, pp. 326-332.
- [24] J. CORREDOR-MATHEOS and Josep Maria MONTANER. *Arquitectura industrial...*, *op. cit.*, p. 50.
- [25] The construction system of all the factories in the colony is briefly outlined in J. CORREDOR-MATHEOS and Josep Maria MONTANER. *Arquitectura industrial...*, *op. cit.*, p. 134.
- [26] Inés DAL MASCHIO. "Santa Coloma de Cervelló. Colònia Güell". In: *Gaudí, Jujol i el Modernisme al Baix Llobregat*. Mediterrània, Barcelona 2003, pp. 145-149; Raquel LACUESTA. "L'Església de la Colònia Güell (Santa Coloma de Cervelló)". In: *Gaudí, Jujol...*, *op. cit.*, pp. 150-157; Raquel LACUESTA and Xavier GONZÁLEZ TORAN. *Modernisme a l'entorn de Barcelona. Arquitectura i paisatge*. Diputació de Barcelona, Barcelona 2006, pp. 212-217.
- [27] Àngel MIRALDA. "Indústria tèxtil. Les colònies industrials". In: Assumpció FELIU TORRAS (coord.). *Cent elements...*, *op. cit.*, p. 63.
- [28] Josep Maria MONTANER. "Arquitectura industrial agroalimentària. Cellers i sindicats agrícoles, caves i destil·leries". In: Assumpció FELIU TORRAS (coord.). *Cent elements...*, *op. cit.*, pp. 74-75.
- [29] Antoni GONZÁLEZ and Raquel LACUESTA. *El Palau Güell. Una obra mestra de Gaudí*. Diputació de Barcelona, Barcelona 2013. See, too, Raquel LACUESTA and David GALÍ. *La vida a palau: Eusebi Güell i Antoni Gaudí, dos homes i un projecte*. Exhibition catalogue. International Year of Gaudí. Diputació de Barcelona, Barcelona 2002.
- [30] Raquel LACUESTA, David GALÍ, Lluís MELICH and Anna SERRA. *Catedrals del vi*. Angle, Barcelona 2009, p. 23.
- [31] On the effects of phylloxera in Catalonia, see: Albert BALCELLS. *El problema agrari a Catalunya. La qüestió rabassaire (1890-1936)*. La Llar del Llibre, Barcelona 1983. Catalan-language edition of the publication cited in note 2.
- [32] Raquel LACUESTA, David GALÍ, Lluís MELICH and Anna SERRA. *Catedrals...*, *op. cit.*, pp. 219-226.
- [33] Raquel LACUESTA, David GALÍ, Lluís MELICH and Anna SERRA. *Catedrals...*, *op. cit.*, pp. 145-152.
- [34] Eusebi Casanelles i Rahola provides a detailed explanation of the historical distillation processes in "El Patrimoni de la destil·lació d'alcohols i derivats a Catalunya". In: *Jornades d'estudi: de la vinya a la fassina. Vinyes, vins i cooperativisme a Catalunya*. Museu de la Ciència i de la Tècnica de Catalunya, L'Espluga de Francolí, 27 and 28 September 2013.
- [35] Raquel LACUESTA. "La fàbrica Calisay. Els edificis de les Destil·leries Mollfuleda". In: Joan CELDRAN DANÉS, Agustí ESPRIU and Raquel LACUESTA. *Gran Licor Calisay. Memòria del bon gust (1895-1995)*. Angle, Barcelona 2013, pp. 208-241.
- [36] A summary of the history and evolution of the Regàs and Gerunda distilleries can be found in Raquel LACUESTA, David GALÍ, Lluís MELICH and Anna SERRA. *Catedrals...*, *op. cit.*, pp. 275-283.
- [37] The author of this article recommends consulting the book *Caves cooperatives en Languedoc-Roussillon* (Lieux Dits, Lyon, 2010) to learn more about the phenomenon of cooperativism in this region of France and its similarities and differences with the phenomenon in Catalonia, as well as their respective architectures.
- [38] Raquel LACUESTA, David GALÍ, Lluís MELICH and Anna SERRA. *Catedrals...*, *op. cit.*, pp. 81-88.
- [39] Montserrat Cucurella-Jorba has extensively studied the construction system of the concrete arches based on information provided in the chapter devoted to the winery in L'Espluga de Francolí in the book *Catedrals del vi*, in the thesis she wrote for her Master's in Architectural Technology entitled *Els cellers de Pere Domènech i Roura*. Thesis supervisors: Cèsar Díaz and Còsima Cornadó. ETSAB, Universitat Politècnica de Catalunya, September 2012.
- [40] Cèsar MARTINELL BRUNET. *Construcciones agrarias en Cataluña*. Colegio Oficial de Arquitectos de Cataluña y Baleares, Barcelona 1975.
- [41] Raquel LACUESTA, David GALÍ, Lluís MELICH and Anna SERRA. *Catedrals...*, *op. cit.* For the monographic study of Pinell de Brai, see: Ramon BER I SABATÉ. *El Celler del Pinell. Cèsar Martinell*. Associació Cèsar Martinell, El Pinell de Brai 1997.
- [42] The work of the architect Masó is extensively studied in Joan TARRÚS and Narcís COMADIRA. *Rafael Masó, arquitecte noucentista*. Col·legi d'Arquitectes de Catalunya and Lunweg, Barcelona 1996; Raquel LACUESTA, Lluís CUSPINERA et al. *Rafael Masó i Valentí. Arquitecte (1880-1935)*. Exhibition catalogue. Fundació La Caixa, Barcelona 2006.
- [43] Cèsar MARTINELL BRUNET. *Construcciones agrarias...*, *op. cit.*, pp. 80-81; Raquel LACUESTA and Josep Ignasi de LLORENS. *Cèsar Martinell. 25 aniversari de la seva mort*. Col·legi d'Arquitectes de Catalunya, Barcelona 1998. Josep Llorens also published another study based on the brick construction systems of the Martinell winery in "Las Catedrales del Vino". *Conarquitectura*, no. 54 (April 2015), pp. 77-84.

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