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- [25] P. Collins, *Concrete*, p. 78; Marian Bowley, *The British Building Industry* (Cambridge, 1966), pp. 12–13, 26.
- [26] 'Monolithic Constructions', p. 60.
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- [28] *C.W.S. Annual* (1916), preface.
- [29] W. S. Murphy, *Captains of Industry* (Glasgow, 1901), p. 200.
- [30] *Ibid.*, pp. 123–124 and 126.
- [31] R. Norman Shaw & T. G. Jackson, eds. *Architecture: A Profession or an Art* (1892), p. xv; *Jnl R.I.B.A.*, 12 (25 Feb 1905), p. 249 (T. G. Jackson).
- [32] Sir Aston Webb, 'Discussion of Sir Henry Tanner's Paper', *Jnl R.I.B.A.*, 18 (January 1911), p. 171.
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An Unusual Organisation of Production: the building firm of the Perret Brothers, 1897–1954

JOSEPH ABRAM*

Paying homage to Auguste Perret in 1951, Pierre Dalloz (who had spent six years with the Perret firm) recalled the exceptional manner in which production was organised in the firm, uniting on a permanent basis "all who have the capacity of conceiving, of calculating, of evaluating and of carrying out any building". It was said to be "a firm which is patriarchal yet has working rules in the forefront of progress" [1]. Dalloz recalled that there were never more than a dozen collaborators in the organisation, including the old draughtsmen faithful to the firm for 40 years, such as Conchon, Brochard and Meunier, as well as young architects being trained, of whom Le Corbusier (then Charles Edouard Jeanneret) was without doubt the best known [2]. The firm's small size was a good idea: "We do not embrace too much; we do not run the risk, where others have failed, of finishing as business what we had started as architecture". Dalloz insisted on the close relationship between architect, engineer and contractor in an organisation where only projects detailed to the last door knob resulted, which of course considerably facilitated site work. The contractor never out-paced the architect, because in the 'ordered world' of the Perret firm, such a pretension would have been inconceivable: "There, we respected the etymology: the architect is the head of all the technicians. It is he who first had the honour of creating, and then the prerogative of sustaining his creation until the last detail". This harmonious integration of various functions, necessary to the act of building, under the name of the architect was possible because of the family character of the firm.

Son of a building contractor, himself a contractor, but mainly an architect, Auguste Perret entered this world and was followed by his two brothers Gustave and Claude. I do not know if he appreciated the rarity of this opportunity. The six years during which I worked for the Perret firm... I had time to ponder upon the strength involved in this brotherly partnership... [3].

A Builder

The Perret firm was before anything else a family business and Dalloz is right to emphasise the fact that in the firm the architect dominated all the functions involved in the process of production. But the term 'architecture' must be understood in a

* Translation by Renée Losier.

fundamental sense, as the “art of organising space” inseparable from ideas of construction [4]. This conception of architecture has its roots in rationalist thought, among theoreticians such as Viollet-le-Duc, De Baudot, Choisy and Guadet, for whom the architect was expected to become once again a builder. This notion of the builder is to be seen in the context of the second half of the nineteenth century, and of the realisation of the crisis in the architectural profession. The *Entretiens sur l'Architecture* of Viollet-le-Duc, the most important work of the author and the most influential on following generations, ends with a warning to the profession: if it does not adapt to scientific progress, if it continues to turn its back while projecting buildings in a bastard style more or less inspired by decadent centuries, it will in the end simply disappear. “The architects will have finished their role”, the engineers will flourish and it will be they who, having scientific knowledge, will produce art required by the times [5]. For Viollet-le-Duc the crisis of the architectural profession opened it to competition with the engineering profession; only scientific knowledge would allow access to the modern means of construction which were necessary to future development.

Emile Trélat's idea was just as alarming: the architect had lost the power to fulfil the requirements of an era which in turn refused the right of the architect to be its interpreter in the name of art. The situation was all the worse since there was, according to him, no systematic form of training and the architects, forced to use various materials, did not know their scientific properties. As a result, they felt relative impotence and inferiority towards the engineers. Why asked Trélat, must the architect fall under the supremacy of the engineer? It was the condition created by “the nullity of his technical education” [6]. To solve this Trélat founded the *Ecole Spéciale d'Architecture* in 1864 on the model of the *Ecole Centrale* where he had studied. He was helped in his undertaking by a whole movement of thought, uniting architects, engineers, scientists and artists. Among the 140 individuals who constituted the private school were Viollet-le-Duc, De Baudot, Flachat, De Dion, Pereire, Janssen, Alcan, Ferdinand de Lesseps and Napoleon III himself. The *Ecole Spéciale*, created after the failure to reform the *Ecole des Beaux-Arts* in 1863, was to attempt to define a new profile for the architect, based on the assimilation of certain capacities of the engineer.

The discredit of the architectural profession extended beyond the circle directly concerned. Stendhal wrote in his “Memoirs of a Tourist” that the architect had lost the logic of his time, the close correspondence of buildings with customs, and that in the end he had not “evolved with life”. For Flaubert, the architect was already the person who forgot the staircase, and for Jean Lahor, he was the person who, with the politician, cost the most money to society while bringing the least honour [7]. Anatole De Baudot, like Trélat, saw in the incoherence of training one of the reasons for the crisis. He criticised in particular the absence of correlation between the classes of composition and those of construction, and opposed a school that produced brilliant architects, but only in the exercise of “composition on paper” [8], systematically neglecting the fundamental training of the trade [9]. De Baudot deplored the loss of authority of the nineteenth-century architect, and dreamt of the time when the builder had lived on the building site among craftsmen and workers whom he directed and supervised. The architect then could still show the arrangement and the assembly of the building components, tracing working drawings and bonding, the means of scaffolding, etc. He could leave to sculptors, glass artists, wood and metal craftsmen a certain initiative, as he was controlling the unity of the undertaking; “it was the golden age of architecture” [10].

One must bear in mind this general realisation of the professional crisis and this reference to a lost age in order to understand the rationalist ideal of the builder. It is with this ideal the Perret brothers seemed to attempt integration of architecture and construction: they did not depend on the builders, as they were themselves builders. With them, said Marcel Mayer [11], the trilogy is complete: “plans, calculations, executions are in the same hand, following the medieval tradition; evolving with the daily control of experience, the foreman appreciates all possibilities but also all necessities, can also work with freedom and certainty. Understood as such the word ‘builder’ regains all its grandeur” [12].

Perret claimed explicitly this title of builder, which for him meant the real expertise of the architect. In an interview given in 1926 to the magazine *Comoedia* [13] he contrasted the official architect trained at the *Ecole des Beaux Arts*, with the architect-builder whose objective was not so much to go to Rome, to the Villa Médici, but to the building site, the factory and the workshop in order to study the conditions of building. “The architect is not only an artist, a dreamer of form; the lines of a project must be done by him, he must build, construct, achieve” [14]. This did not only mean to Perret that the architect's projects should be realistic as well as feasible, but also that the architect should have the power to carry these out by being the contractor himself. It was not in the name of evolution that he defended the builder's standpoint; his definition only appears close to that of Jean Prouvé, for whom the builder had to be involved in the process of production if industrialisation of building was to be achieved [15]. Perret referred rather to the traditional function of the architect, that which could be read in the history of building. This might appear an anachronism considering the division of labour imposed by the industrial revolution. It is significant that in order to defend his definition of the architect-builder, Perret referred to Victor Louis, whose titles, he said, nobody ever thought of questioning and who intended to remain the absolute foreman, from the laying of the first stone to the last brushstroke, buying materials, exploring forests for getting the best timbers, at last running a building firm. “That is our art!” declared August Perret; but suddenly changing his mind, he added “it was that for the eminent masters of the past” [16], because what is constantly underlying this profession of faith is the realisation of architecture's crisis. We are in 1926: Auguste Perret was answering Jean Pierre Liausu's questions about the opportunity in France of creating an order of architects. His response was negative. Founding an order of architects would mean digging up the Guadet code and distinguishing conception from realisation: “the architect who does not build is like the thinker who cannot write” [17].

If one dared to have *all* architects undergo the only test that seems logical, the test of construction, it would be realized that very few know their trade.

The officials would never lend themselves to such a joke. . . .

In these conditions, concluded Perret, “Hurrah for freedom! May we be left in peace! When time comes we will compare . . .”.

Nonetheless, towards the end of his life, when an Order of Architects was effectively created in France, Auguste Perret agreed to become their President, just as the professional crisis was getting worse. Things were in fact changing for him, with recognition in France and abroad. In 1926 at the time of the interview with *Comoedia*, he was still fighting the institution and suffered from a negative image in the architectural establishment; he was criticised for not having a diploma of architecture

and being implicated in a commercial organisation such as a business. Moreover, the material with which his name was associated was rejected amongst official architects who perceived it as a vulgar matter, only good to be employed by 'contractors'. After all, did not De Baudot himself at the beginning of the century establish a subtle distinction between reinforced cement, a material worthy of architecture, and reinforced concrete, a less noble material? [18]. The *Ecole des Beaux Arts* was hardly concerned with such nuances and rejected altogether anything which more or less evoked building forms. Le Corbusier's anecdote of the engineer Bienvenu being booed by the Ecole's students in 1908 for having mentioned reinforced cement is well-known: "You take us for builders!" shouted the students from the tiers of the amphitheatre. The temporary lecturer thought it wiser to talk instead about jointing in the timber framework of Gothic cathedrals, and order was restored [19]. The image of a builder such as Perret, contractor and moreover, a specialist in reinforced concrete can be imagined. This negative image certainly played a decisive role in the boycott by the Ecole's juries of the *Atelier libre* opened by Perret in 1923 and forced to close five years later because the students were ostracised [20]. This image seems to have persisted for a rather long time amongst official architects, as witness the comment of Roger Henri Expert to the students of his atelier when told of Auguste Perret's election to the Institute: "that is it, the builder is being honoured" [21]. Of course, Perret was proud of his expertise as a builder [22], but he considered himself, above all, as an architect-builder and the organisation of the firm that he formed with his brothers Gustave and Claude was much more than just a building firm. Not only was reinforced concrete made its speciality, but also it added to this knowledge that of the architect, heir to the best theoretical traditions of the nineteenth century. On this rationalist basis, the firm was able to take an *avant-garde* stand on the practice of construction as well as that of architecture. Le Corbusier was wrong; during his training period at the Perret brothers' firm, 25a rue Franklin, he understood that something exceptional was happening there, yet the Perrets did not have many works to their credit. There had been the building on rue Franklin and the garage on rue Ponthieu, and they were in the process then of erecting the Oran Cathedral for the architect Ballu [23]. Le Corbusier discovered there building contractors responsible for fee, soundness and building to time, able to take over the architect's plans and reinterpret them with their own calculations and drawings.

They instituted, at that moment, this new function for our era: the builder. Neither the engineer alone, nor the architect alone, but both in a responsible whole. Fortunate circumstances allowed them to adapt that role: temperament, a traditional family firm and a commercial base which they exploited, and the presence of a third brother who could draw anything. In town, amongst colleagues, we discussed seriously whether in such conditions the Perrets should be allowed to bear the title of architect... [24]

This new function of the builder, which Le Corbusier thought a necessity of the time, was in fact a relic that was to contradict more and more the division of labour that is forcibly established in industrially advanced countries. The organisation of the Perret brothers' firm, permitting a complete control of the processes of production from the first sketch to the building site, was in fact an 'island' in the context of French twentieth century building. It was the result of a fortunate combination of circumstances rather than an economic tendency of the time.

A Family Firm

The origin of the Perret firm goes back to the nineteenth century. The father, Claude Marie Perret was a Burgundian stone mason from the small village of Sennecey Le Grand near Cluny. Attracted by the activity of the capital, he left his province and settled in Paris at the age of 20. Here he came in contact with revolutionary ideas to the extent that when the insurrection of the Commune broke out, he was amongst the rebels. When after a few months the resistance of the Commune was put down, he was accused of having taken part in setting fire to the Tuilleries, and to escape the Versailles repression, with his wife he fled to Belgium. In Brussels at the age of 23 he founded his first firm (with other exiles), and there his three sons were born: Auguste, on 12 February 1874 [25], Gustave in March 1876 and Claude in July 1880. Brussels was then booming and the firm was rapidly given contracts. It carried out the stone installation for the greenhouses of the royal residence of Lacken, the water point and the pier of Spa, etc. The family was flourishing; yet when the amnesty of the Commune rebels was voted on 11 July 1880, Claude Marie Perret decided to give up everything and return to Paris [26]. Back in the French capital he settled on rue Vaugirard and in 1883 founded a general building firm. This firm, to which he progressively associated his sons, became in turn the 'Entreprise Perret et Fils' (1896, 43 rue du Rocher, Paris 8), then the 'Entreprise Perret Frères—Architectes—Constructeurs—Béton Armé', situated initially at 25a de la rue Franklin, Paris 16 and then from 1930 at 55 rue Raynouard, Paris 16 [27].

It seems that Auguste and Gustave were introduced to their father's work at an early age. Having spent their childhood in the atmosphere of the building site they became familiar with the processes of construction and were given certain responsibility. In 1889 Auguste worked out the technical details of the Tour du Temple, a temporary structure of light materials that his father had to rebuild for the Universal Exhibition [28]. The same year he executed the plans for the family summer residence, Ravin cottage at Berneval-sur-Mer, near Dieppe [29]. When after secondary studies at the Ecole Alsacienne the two elder brothers were ready to attend higher education, the father sent them both to the Ecole des Beaux-Arts to become architects.

Auguste entered the second class in July 1891 and joined Guadet's atelier. He was then 17 years old. He was followed two years later by Gustave who joined the same atelier. These years spent by the two brothers at the Ecole des Beaux-Arts were decisive for the future development of the Perret firm; it is quite incorrect to say, as Pierre Vago did in 1932, that the Ecole did not contribute to their training [30]. On the contrary, everything shows that it was during this period that the Perrets assimilated the rationalist principles which were to make architectural significance of their experiments with reinforced concrete. Auguste did particularly brilliant studies on rue Bonaparte. He earned a score of 29 honours in the second class, of which two were medals, and he was brought to the attention of the jury for an 'Ionic portico', which brought an unusual award: the display of the project in the Salle de l'Horloge. Admitted to the first class in November 1893 he earned 31 honours of which five were medals as well as the Prix de Reconnaissance des Architectes Americains (1 December 1895). This particularly dazzling *cursus honorum* testifies to the classical training of Auguste Perret and explains certain aspects of the architectural and constructional problem of his first important works: the building on rue Franklin, the garage on rue Ponthieu, the theatre of the Champs Elysées. Fundamental to his future development was the contact with his teacher Julien Guadet, one of the most prestigious masters

ever at the school, who on his death was hailed as the modern Vitruvius on account of the importance of his theoretical work. Guadet was an eminent rationalist; he attempted to base his course on a reasoned analysis of the historical heritage and argued for a more open concept of classicism [31], a concept which he tried to place beyond doctrinal antagonisms and which he communicated to his best students [32]. Peter Collins has shown the debt the Perrets had to Guadet. The relationship between the two brothers and the professor went beyond the traditional relationship between teacher and students, as a result of their friendship with Paul Guadet, who was also a student in his father's atelier. The three young men formed with four other fellow students the 'club of seven', a group which met regularly at the Guadet house [33]. The Perrets' assimilation of Guadet's doctrine was without doubt due to these close relationships [34]. Thanks to their teacher and to their early acquaintance [35] with Viollet-le-Duc's theories (Claude Marie Perret owned a copy of the famous *Dictionnaire Raisonné*... [36]), the Perret brothers assimilated the best of late nineteenth-century rationalist thought.

A family photograph, anecdotal but symbolic, shows Auguste and Gustave in the apartment occupied by the family in 1899. In the background, Viollet-le-Duc's *Dictionnaire* can be seen; on the mantelpiece is the portrait of Guadet and in the mirror *L'élément analytique* of 1892 [37]. How could one sum up better the intellectual influences on the young Perrets from the time of their studies at the Ecole des Beaux Arts?

In spite of their remarkable scholarly achievements, the two brothers left the Ecole without having presented themselves for their diploma. Auguste had been admitted in 1895 for his second attempt at the Grand Prix de Rome but had judged it useless to proceed further [38]. Gustave achieved honourable studies, although less brilliant than his elder brothers' two medals in the second class and three in the first. They continued to visit Guadet's atelier until 1901 but this was on a very occasional basis, because they were more and more absorbed by their father's firm, which after Auguste's military service (1896) became the Perret et Fils business.

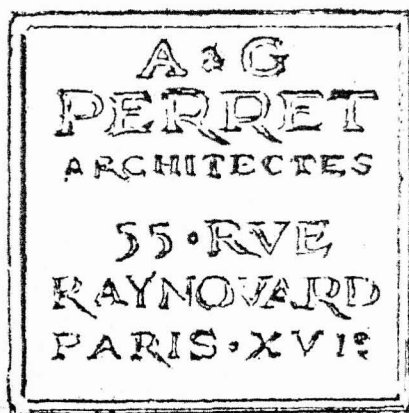


FIG. 1. Seal of the Perret Brothers firm.

The Entreprise Perret et Fils: 1897–1905

Towards the end of the 1890s the joint architect-contractor appeared in the Perret firm. Some jobs were done by the firm for other architects and similarly certain projects signed A. and G. Perret were carried out by other building contractors; the latter was the case with the St Malo Casino, conceived by the two brothers and realised by a Breton firm. But more and more the Perret firm was executing projects drawn by Auguste and Gustave: for example, the commercial building of 10 faubourg Poissonnière (1897) (Fig. 2) and 119 rue Wagram (1902). These first achievements employed the usual technology of the time: cut stone, brick, iron floors, glass walls with metal frames. The building of rue Poissonnière, Paris 10, is certainly the most interesting of these first structures. Sited on a deep piece of land, it is almost entirely used for commercial purposes. Only the top floor (the fourth) and the attic house the staff of the offices and shops below. The structure rests on 6m deep concrete shafts, joined together by millstone arches. The floors are of steel with Vaugirard brick vaults lined with cement. The street facade is of Mesnil-le-Roi stone with a basement of Euville stone and the garden front is covered with white bricks from Chartres. The main living storey has a large balcony divided into three bays by means of three slabs of stone 4.5m wide and 390mm thick. Inside a monumental iron staircase can be seen electric passenger and goods lifts; heating was by a low-pressure steam system. This commercial building brings into play in a very practical and heterogeneous manner traditional and industrial materials, as had become the custom in Parisian building practice of the time [39].

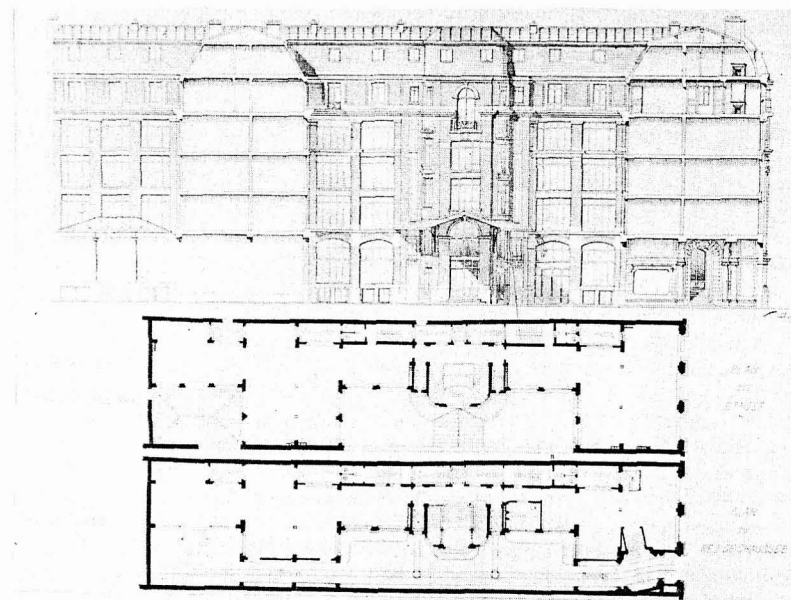


FIG. 2. 10 Faubourg Poissonnière, Paris (1897): plans and section.

The St Malo Casino (Fig. 3) erected the following year by the building firm Rennes Poivrel et Fils shows a similar mixture of technology. It is built in granite, wood and reinforced cement. The use of granite here is purely accidental; the land on which the building was to rest had been filled to a height of 2.5m with small blocks of granite in 1850. The architects decided to use this material for their construction when they discovered from trial holes the unexpected source of materials, which in any case had to be cleared out to place the footings on sand. The rubble stone was used as it was, jointed in cement for the walls, and cut for the window and corner dressings. The architects ordered monolithic granite shafts for the 12 columns of the porticoes, thus securing the unity of the whole. The 2500m² casino with its theatre and series of rooms and lounges was a project of considerable scale. The cruciform plan has an admirably clear arrangement [40]. The building was executed in the record time of nine months, of which two were lost because of bad weather. The most spectacular element is without any doubt the great structure over the main room. It comprises trusses with a span of 26m (with pitch pine principal rafters 17m long) and the dome of the theatre was executed in wood with iron ties. This honest building follows the custom of the time: there is still a long way to go to the principles which will bring fame to the Perret brothers in 1910. This casino with its great open roofs and skylights seems to take its place in the regional context. Its aesthetic is not without links with a country house project, presented by Gustave Perret in 1898 to a competition of the first class (a project that got him a medal) [41]. The only innovation, as compared to the 1900 approach, is the use of reinforced cement for the high floor of the American bar which in turn forms the terrace for the ground floor cafe. The semi-circular floor, 300m² is supported by reinforced cement beams, spanning 15m (with a height of 590mm). This system is not visible as the space between the beams is hidden by a false ceiling of coated timber boards. It is the only part of the project using reinforced cement, all the other floors being of wood and iron. But there lies all the historical importance of the casino, because as Auguste Perret said later, it is here that he realised all the potential of the new material. It is of course difficult to know all the reasons that prompted the architects to use reinforced cement. Perhaps the contractors Poivrel et Fils had a certain knowledge of the material. It is significant that the Perret firm did not introduce the new material to the structures immediately following the erection of the casino; the building on rue Wagram built in 1902 used totally traditional building techniques. The stone façade and its classical arrangement [42] are interesting to the extent that they allow one to appreciate the immense advance achieved, a year later, in the building of 25a rue Franklin.

As with the St Malo casino, the plans for the rue Franklin building (Fig. 4) were by Auguste and Gustave Perret, but the construction was not carried out by the family firm. It was done by a Hennebique agent: Latron et Vincent, public works contractors (67 rue Amsterdam, Paris). The reason for the sub-contracting was the technique used, reinforced concrete. The Perret Fils firm had not yet mastered the means of making use of the new material and the father was doubtful as to its potential [43]. The Perret sons, however, wished to use reinforced concrete for this project because it allowed maximum use of the cramped site, on which a masonry structure would have considerably reduced the living area. It must be pointed out here that the Perret family was the client, and was to take care of the marketing of the apartments, reserving the ground floor for the offices of the firm [44]. This gave scope for an architectural experiment with reinforced concrete; it is doubtful whether an ordinary individual would have accepted such daring plans. Giedion rightly notes that the obvious fragility

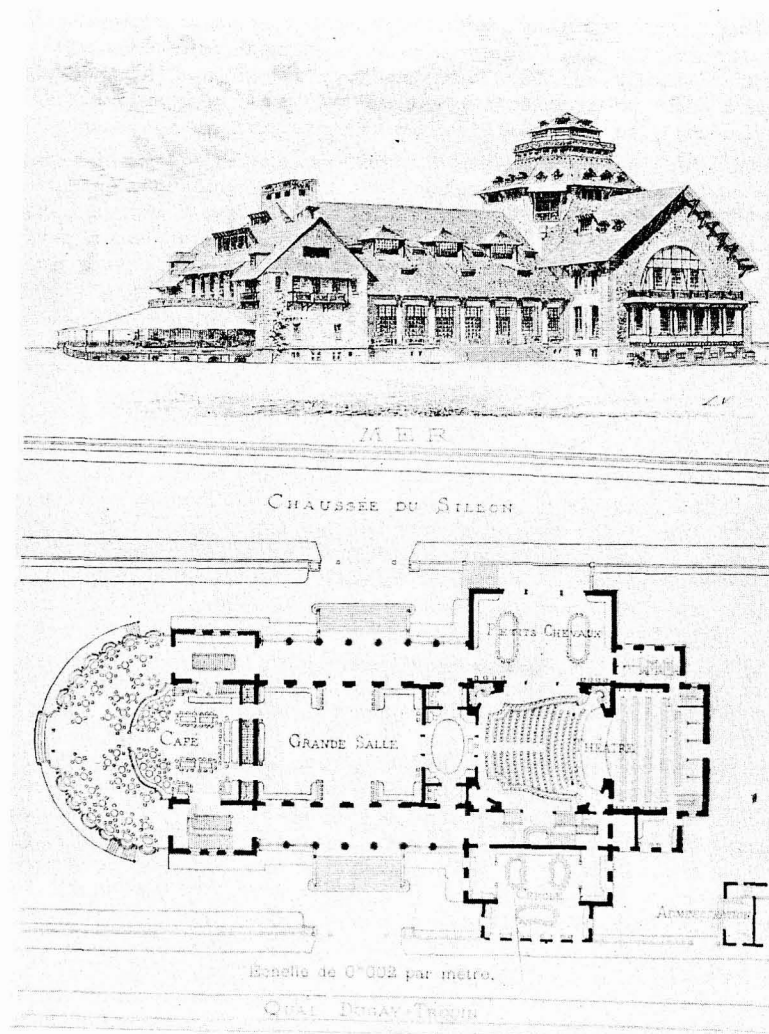


FIG. 3. Casino of St Malo (1898–99) (destroyed): plans and elevation.

of the structure caused adverse financial consequences as banks refused to mortgage the apartments, taking advice from experts who predicted an imminent collapse [45]. Reinforced concrete was still doubted at that time and this in spite of the publicity campaigns of François Hennebique. Perret pointed out in 1933 that even if the calculation methods had rendered the material reliable before 1900, it was still regarded with suspicion by both architects and the general public because of a series of spectacular accidents, caused by the builders' lack of experience. Perret recalled in

particular the case of a footbridge built on the 1900 exhibition site: the footbridge supports were temporarily blocking the traffic on avenue de Suffren, and urged to clear the avenue, the builders removed the supports too soon and the footbridge collapsed, killing several people [46]. Such catastrophies could only make the public suspicious and it was truly daring to conceive an architecture so visibly light, revealing the framework in the manner of metal structures [47].

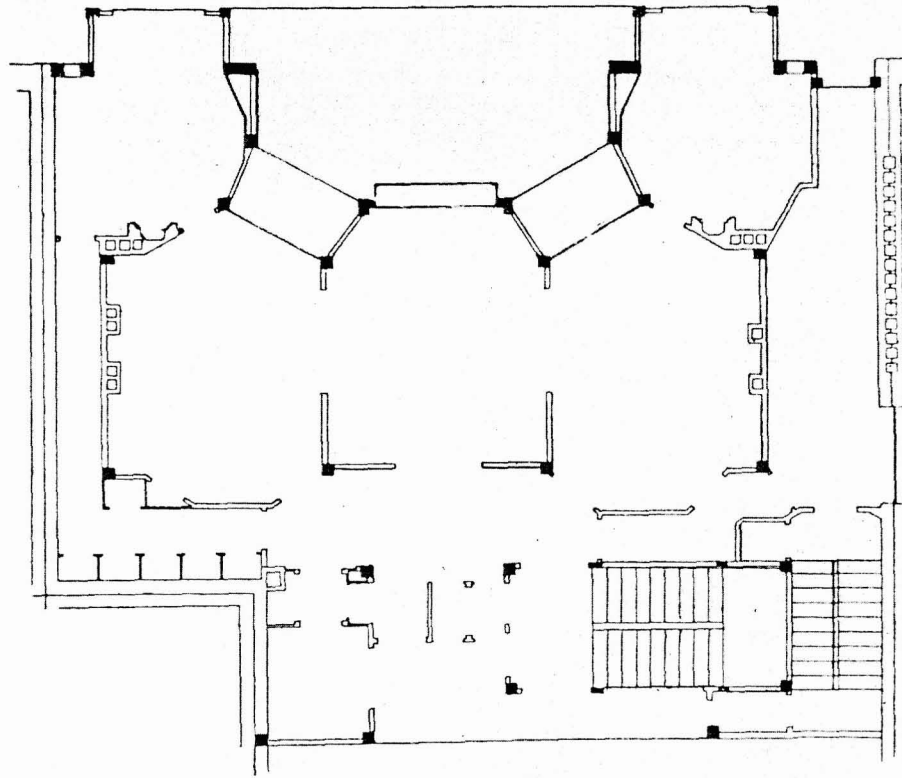


FIG. 4. 25 bis rue Franklin, Paris (1903): plan.

The rue Franklin building gave rise to a lot of comment and undoubtedly it represents an important step forward in the evolution of modern architectural thinking. No book on the general history of twentieth century architecture has neglected to mention it as an innovative project. Here it is only necessary to quote what Auguste Perret said in 1933 on the subject:

Thirty years ago, we built our house on rue Franklin; it is the first house to be built in visible reinforced concrete sections, that is revealing its framework as is still done today. At that time we thought that a facing was

necessary for the preservation of the iron; we covered it then with *frambé* stoneware which we considered to be the appropriate material, but we were careful to execute the form of the facings differently, according to whether they were to be applied to piers or to walls, so as to reveal the skeleton. [48]

Much has been said on the question of covering. Marcel Mayer regrets that the ceramicist (Bigot) "distracted by the taste of the day" (that is *Art Nouveau*) interpreted the geometric drawings of the Perrets as sketches and produced rhododendrons from them instead [49]. Paul Jamot maintains that two or three years later the architects would have left out any ornament [50], and Collins sees it as a precaution justified by the lack of confidence in the work carried out by external contractors [51]. But all acknowledge the differentiated use of stoneware tiles and Jamot even concludes that the walls' marquetry of leaves, by its appearance of lightness, helps to underline the fundamental character of an architecture in which the authority lies in the framework.

In fact it is the ulterior development of the Perrets' doctrine that puzzles the critics, in as much as this question of the legitimacy of ornament needs to be understood in the context of rationalist theories. Viollet-le-Duc in his reading of Greek and Gothic architecture admitted the existence of a sensual language taking over the constructive structure. The fluting of Greek temples or the triglyphs and metopes are elements of ornament finding their legitimacy in a certain relation to the mode of building or construction. The ornament has its autonomy on the level of language but it must *express* as best it can the constructive reality. This question of expression is fundamental here because the Perret brothers' contribution lies at the level of architectural aesthetics. They contributed, not to the development of the reinforced concrete technology, but to an architectural solution for the use of the material conditioned by rationalist ideals. Moreover, their way of using the pier-slab structure of the Hennebique system is highly significant. The framework here is totally subjected to architectural choice with the U-shaped classical plan, combining symmetry and asymmetry, determining the location of the piers. It is a 'built plan', as the space is not homogeneous and the building system is diversified. Weight is carried on the surrounding masonry walls, on the 'concrete slabs' of the facade and on the piers, the location of which corresponds to the extremities of segments dividing up the space. The representation of the structural system on the facade follows the actual framework faithfully except for a few cases [52]. The concrete slabs of the facade lining up the street are visibly treated as piers, which has the effect of artificially lightening the structure. Perret has used, however, on the *viole* a motif other than the floral pattern of the infills; he has repeated the ceramic stud ornament of the 'basement'. All this is in fact a refined expressive system, which Perret never gave up, even in his subsequent projects. On the contrary he used his status as a contractor to push more and more the coincidence between the constructive system and the expressive system reaching the absolute transparency of the Mobilier National and the Musée des Travaux Publics.

This house on rue Franklin was an important step for the Perret brothers because it helped them to bring to light a coherent structure of intention on which they relied for all their later work. It represents for reinforced concrete the expressive transparency already achieved by metal construction. The facade of the Gantt Building on Chestnut Street in the River Front area of St Louis (1877), that of the first Leiter Building of William le Baron Jenney in Chicago (1879), or of the Reliance Building of Daniel Burnham (1894) [53] are variations on the theme of constructive expressiveness. There is also the remarkable Maison du Peuple of Victor Horta (Brussels, 1897).

The precedence of metal construction in the question of transparency explains undoubtedly why works such as the Petit Parisien building (Paris, 1903) or the Magasin Job of H. Gutton (Nancy, 1901) passed almost unnoticed. The problem of reinforced concrete was tackled at the time on very different terms and the historians were right to compare the rue Franklin building with the one built by François Hennebique in 1901 on rue Danton in Paris. The logic of Hennebique (without whom the Perrets would never have built the house on rue Franklin) was fundamentally commercial. This propagandist of reinforced concrete wanted first and foremost to prove the economic and plastic qualities of reinforced concrete, without breaking the securing image of the typically Parisian buildings. The over-abundant ornament of the rue Danton building and of the Magasin Félix Potin rival the traditional advantages of masonry architecture [54] without questioning its public images. The situation had little to do with the construction of the industrial buildings that Hennebique was to erect, where he could accept absolute transparency (Charles Six mill at Tourcoing and Barrois Frères mill at Fives-Lille) [55]. No commercial demonstration was needed for the Perret brothers on rue Franklin as what counted above all for them was to take full advantage of a modern material to obtain the best from a very small site.

After this spectacular achievement, the Perret firm carried on building in a traditional manner buildings at 83 rue Niel (Paris 17) in 1904 and at 48 rue Raynouard (Paris 16) in 1906. Later the firm was to identify itself more and more with reinforced concrete, building only very occasionally with other materials (in particular with timber when structures were of a temporary nature [56].

Perret Frères (1905–1954)

Claude Marie Perret died in 1905 at the age of 58 leaving the family firm to his sons. The three brothers became partners and created the firm of Perret Frères [57] which they were to operate for nearly 50 years. In the years immediately following 1905 they devoted themselves to the study of reinforced concrete, and defined the style they were to continuously develop until after World War II. Auguste Perret regarded the garage on rue Ponthieu (which he dated to 1906) as the first attempt in the world at a 'concrete aesthetic'. The circular of 20 October 1906 had just come out and said Perret,

It was an encouragement. It was not without difficulty, however, that we succeeded in having this system accepted for floors, capable of supporting cars and travelling cranes. [58]

Most historians date the rue Ponthieu garage to 1905 [59]. In fact, as the archival documents kept at the Paris Conservatoire National des Arts et Métiers show, the first drawings of the visible concrete facade date to 1907. The archive contains the first project, dated 26 June 1906, which shows a facade with brick and stoneware facing of a similar type to the one used on rue Franklin. The motifs are however no longer floral but geometric [60]. It was with this work that the Perret brothers developed their new manner. Since it was a utilitarian structure, economic factors may have prevailed, especially since the Perret firm was responsible for the execution of the project, and the use of concrete made it possible to leave out the supply of stoneware by a ceramicist.

The facade is a powerful framework in close relation to a plan of obvious simplicity: a central nave with two multi-storeyed galleries (which cars reached by

means of a lift). Offices are located on the fourth floor. As was rightly explained by Julius Posener, Perret developed here a "representation of construction", distinguishing clearly the main frame from the secondary frame, the vertical elements from the horizontal, the load-bearing parts from the infill, and articulating all these elements in a perfectly classical manner [61].

The structural skeleton is given more importance by the fact that the infill is only glazing; a geometric rose window indicating the height of the central nave and large bays for the lateral galleries. The presence of offices is indicated by a series of vertical windows forming an attic under the prominent cornice, terminating this great street facade (in the 1906 project the offices were on the first floor). It was through the classical handling of the constructive system, based on the use of the proportions, that the Perret brothers achieved maximum expression with the new material. A comparison between the two versions of the garage is eloquent in that respect. This manner of expressing the proportions of the framework is related to the 'Theory of the Perfect Monument' that Viollet-le-Duc developed in his reading of the Greek temple [62]. It was when the 'brutalist' use of reinforced concrete met the rationalist theory of expressing construction that the Perret brothers achieved a new expression of the material [63]. Architecture dominates the structure so as to display it, implying a clear distinction of architecture in relation to construction.

It is interesting to quote here the twofold comment of Auguste Perret on the Pont Alexandre III and the Orly hangars. The noble part of the Pont Alexandre is the arch which crosses the river in a single span. This is what should have been emphasised, but as it was pretending to be 'art', the engineer called to his assistance a designer who managed to destroy with badges, angels and garlands the real elements of beauty contained in the work. Conversely with the Orly hangars, because of their function and location, 'art' was not attempted and the arch in the shape of a parabola was not 'massacred'.

But [asked Auguste Perret] is it Architecture? No! Not yet! It is the achievement of a great engineer, not of an architect. When the hangars are seen from afar one wonders what these two half-buried pipes are. When Chartres Cathedral is seen from the same distance, one wonders what is this great building, and yet Reims, Paris and Chartres could easily fit in one of these Orly hangars, and five cathedrals would fit in its area. What is missing in the Orly hangars for them to be an architectural work is Scale, Proportion, Harmony and Humanity. . . . [64]

This distinction between architecture and construction might appear surprising coming from a man like Perret who, as we have seen, claimed the status of a builder, but it explains the meaning of his work. Architecture, manipulating structure in its rough state, we could say in its violence [65], is reduced to its most abstract essence: geometry, proportion, harmony, number [66]. Architecture returns in some way to the essential in order to shape structure, to mould it with classical intellect without taking away its force. With the Perret brothers architecture becomes construction and structure becomes language [67]. This distinction between architecture and construction allows understanding of the particular nature of their firm. In 1907 it was still called 'Perret Frères—Entreprise Générale de Travaux Publics et Particuliers—Béton Armé', but Auguste and Gustave were signing their plans one next to the other as architects. Soon their designation changed and their commercial organisation was symptomatically called 'Perret Frères—Architectes—Constructeurs—Béton Armé'.

Auguste and Gustave were signing themselves 'A. G. Perret'. The integration appeared to be complete but the function of architecture continued to be distinct.

During the years following the rue Ponthieu garage, the firm gained experience with reinforced concrete, a material with which it became completely familiar. There were large-scale works: Oran Cathedral, the theatre of the Champs-Élysées, the docks of Casablanca, Esders workshops, and the Voirin et Marinoni factory at Montataire. Archival files concerning structures like the Montataire factory show the precision in the technical approach of the Perret firm, which by then had the identity of a reinforced concrete research consultancy [68]. Their mastery was complete, making it possible to get eminent commissions such as the church of Raincy (Fig. 5), the Mobilier National and the Musée des Travaux Publics [69]. If the Hennebique system was still used 'as such' for the rue Ponthieu garage, the Perret brothers took it over in order to 'architecturalise' the later experiments. Proportion reigns everywhere, piers become columns and are given back their fundamental place in the composition, emphasising the relation to base and architrave [70].

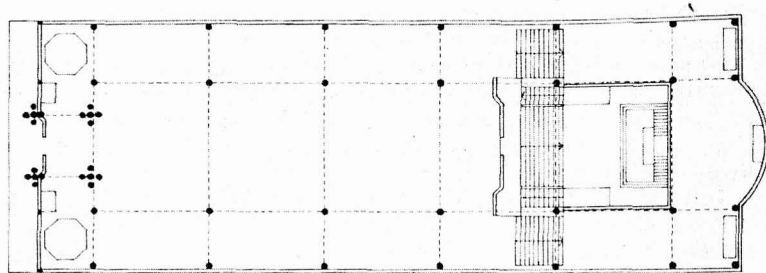


FIG. 5. Church of Notre Dame, Le Raincy (1923): plan.

This taking over of the system is strikingly exemplified by the Theatre of the Champs-Élysées (Fig. 6), a prestigious job for which the concrete work was to take the tone of a manifesto. The authorship of the theatre caused a long conflict between the Perret brothers and Van de Velde [71]. At first the project had been given to the architect Roger Bouvard, but the sleeping partner thought he lacked inventiveness. Through the painter Maurice Denis, Van de Velde was brought in as consulting architect. Van de Velde redrew the plans and, wishing to use reinforced concrete, called on the Perret brothers to act as contractors. The latter (somewhat dishonestly) declared the project unbuildable in reinforced concrete and proceeded to study the structure (from Van de Velde's plans delivered on 30 March 1911). The controversy over the authorship of the Theatre stems from the difference (acknowledged or not) between the plans of 30 March and the actual building [72].

What were the arguments formulated by the Perret brothers concerning their claim about the project? The famous question of structure is at the centre of their argument with Van de Velde.

You attribute to us... the four groups of two pylons in the hall. Well, but it's over, it's decided, this is the whole theatre... the architecture of the

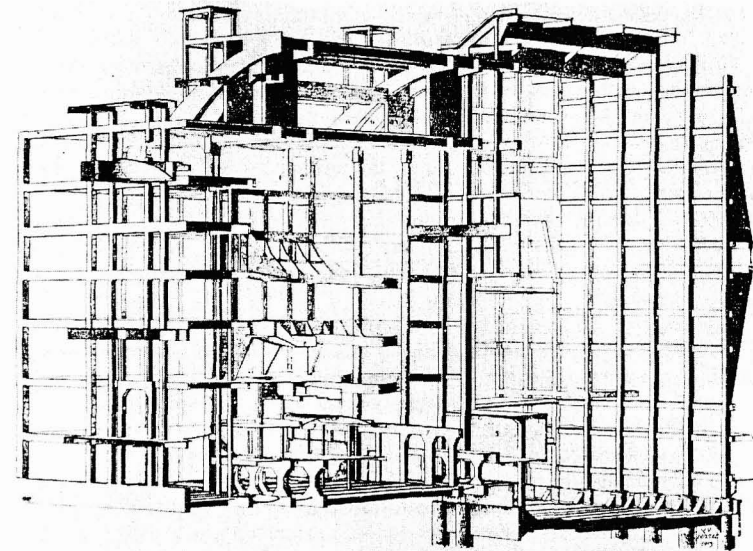


FIG. 6. Theatre of the Champs-Élysées, Paris (1911): perspective of the structure.

whole building relies on four groups of two symmetrical pylons resting on two large beams and supporting two bridges. Four pylons, four staircases, four entrances, the whole surmounted by a cupola or crown in four parts. [73]

For the Perret brothers, the four pylons gave the hall its particular aspect and the theatre its layout, all the piers being lined up by these four groups. By refusing to hide the structure with abundant ornament, they defined the aesthetic of the whole:

It appeared as if they wanted to neglect the structure, hide it... confuse our pylons... It was then that we told M. Gabriel Thomas 'Watch it, we are building you one theatre in reinforced concrete, and another covered with junk. You will spend on that second theatre a lot more than the savings made through our solution, because reinforced concrete is an economical way of building, but the true, important saving in our case as with all other cases, lies wholly in the rational and simple solution to a problem'. [74]

The Perret brothers proposed to put the tracing of the structure over the finished plan with the aim of understanding the absolute accordance of all the piers which constitute the layout of the theatre. The tracing of the structure over finished plan is the confirmation of that coincidence between structure and appearance so dear to the great nineteenth century theoreticians of rationalism, Viollet-le-Duc and Guadet.

Whatever may be the legitimacy of Van de Velde's claims, it is clear that within the framework of the Perrets' doctrine and the rationalist theories sustaining it, the theatre as a laid-out structure can only be their work and for them, there lies the final project. This is apparent in all their work. For them, true architectural innovation consists not

in creating new models [75], thus changing the character of the building in its historical tradition, but in renewing the type through a new conception of the structure [76].

The link between the means of building and the architectural quality of spaces is so strong in this doctrine, that there is a complete assumption of the project. The Perretts could not accept the usual division of labour which divides the conception of a project from its execution by a contractor. It may be noted that this corresponds perfectly to Le Corbusier's analysis of the Oran cathedral project. It could easily be demonstrated that the same process works for the Palais du Gouvernement at Algiers, which was Guillauchain's scheme, but completely taken over by Pierre Forestier of the A. G. Perret firm and carried out by the Perret Frères [77]. The scheme ceased to be Guillauchain's or even Forestier's in order to enter into the conceptual mechanism of the Perret brothers.

Following the Theatre of the Champs-Élysées and the stir that it caused within French artistic circles, the church at Raincy brought the firm international fame. Justly nicknamed the Sainte-Chapelle of reinforced concrete, it became the symbol of the new material, expressing in a powerful synthesis the architectural principles of its authors [78]. The Perret brothers were to follow their theory to its logical conclusion with the Mobilier National (1932) and the Musée des Travaux Publics (1937), meticulously building an 'underground shelter' fulfilling the old dream of the rationalists [79]. From the columns of the structural skeleton to the breezeblocks of the infill, the same attitude toward hierarchical articulation and clarification of the construction is observed [80]. These buildings are totally devoted to concrete and to its implementation; and the Entreprise Perret was to mobilise all the expertise acquired over nearly three decades.

Conclusion

In its first years the Entreprise Perret Frères was transformed from a general firm building traditionally to an new organisation using reinforced concrete for architectural purposes, in order to realise a rationalist ideal formulated in the last quarter of the nineteenth century. During the inter-war period this new organisation was at its best. The chain was then complete: Perret, running an open atelier at the Ecole des Beaux-Arts from 1923 to 1928 was led to theorise about his practical experiments and clarify his own doctrine. The firm was growing with the creative work of young trainees, such as Nitzchké, Forestier and Honegger, who knew the underlying doctrine of Perret's work through his teaching at the Atelier du Bois. Oscar Nitzchké recalls how, when he worked in the firm, work was distributed remarkably; Auguste was the architect, Gustave the engineer calculating the structures, and Claude the financier. There were technical draughtsmen (Brochard, Conchon, etc.) and architectural draughtsmen like himself and Honegger. Auguste would bring them small sketches, drawn at home or on site, and ask for them to be enlarged and developed.

These sketches were very precise and contained the whole project. I remember such a drawing that he had entrusted to me for the project of the Bourdelle funeral monument... I also worked with Honegger on the building on rue Raynouard, in particular the Perret's apartment, and on the famous staircase of the Atelier. We also drew for the Palace of Soviets competition and for a great number of other projects. I stayed there three years and for me it was a very good experience. It was necessary to draw very

well to work at the Perretts. In general those who have followed Perret have retained the expression of the structure, the regularity of the framework. As for myself I was especially influenced by this precision and the necessity to build simply. [81]

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- [1] P. Dalloz, 'Un Hommage à Auguste Perret', in *L'Architecture d'Aujourd'hui*, 23 (Feb.–March 1953), pp. 10–1.
- [2] Le Corbusier worked for 14 months at the Perret brothers' in 1908–1909.
- [3] Dalloz, 'Un Hommage', p. 10.
- [4] See A. Perret, *Contribution à une Théorie de l'Architecture* (Paris, 1952).
- [5] E. Viollet-le-Duc, *Les Entretiens sur l'Architecture* (Liège, 1977), p. 445.
- [6] E. Trélat, 'Discours d'Inauguration de l'Ecole Spéciale d'Architecture', in *L'Ecole Spéciale 1865–1965* (Paris, 1965), pp. 6–7.
- [7] J. Lahor, *L'Art Nouveau* (Paris, 1901), p. 117.
- [8] A. De Baudot, *L'Architecture, le Passé, le Présent* (Paris, 1916), pp. 200–204.
- [9] For De Baudot 'the trade' means mastery of construction.
- [10] De Baudot, *L'Architecture*, p. 189.
- [11] Mayer was the first biographer of Perret. His unpublished monograph was written in 1926, a year before the publication of that of P. Jamot.
- [12] M. Mayer, 'Perret' (unpublished, Paris, 1926), pp. 36–37.
- [13] J. Liausu, interview with A. Perret in *Comoedia*, (31 June 1926), pp. 234–40.
- [14] Perret's conception goes beyond that of De Baudot or Viollet-le-Duc, for whom the constructional knowledge of the architect did not necessarily imply the practice of contracting.
- [15] Prouvé also had his own firm, the famous workshops of Maxéville, near Nancy, which specialised in metal construction (corrugated iron). He believed in light industrialisation modelled on the car industry.
- [16] This nostalgia is a constant with the rationalists.
- [17] A. Perret said "Construction is the mother tongue of the architect". See A. Perret, 'Architecture—Science et Poésie', in *La Construction Moderne*, 48 (2 Oct. 1932), pp. 2–3.
- [18] De Baudot, *L'Architecture*, p. 163.
- [19] Le Corbusier, 'Perret', in *L'Architecture d'Aujourd'hui*, 2nd ser. 3 (Oct. 1932), p. 7.
- [20] See L. Vauxcelles, *Les Carnets de la Semaine* (13 June 1926), pp. 263–4.
- [21] Remarks gathered by P. Vago.
- [22] See B. Champigneulle, *Perret*, p. 10.
- [23] Le Corbusier worked 5 hours per day at the Perretts' and also supervised the building sites. His impassioned discussions with Auguste Perret retained great importance for him.
- [24] Le Corbusier, 'Perret', p. 7.
- [25] "On 12 February 1874 Auguste was born, his third child, the first boy. A

- celebration took place on the site of Molenbeek Street . . .", Mayer, 'Perret', p. 21.
- [26] This amnesty law resulted from a manifestation of the Commune survivors at the Mur des Fédérés, 23 May 1880.
- [27] These two buildings were built on land bought by the firm.
- [28] Auguste invented a system of metal ties to hold the structure.
- [29] A modest one-storey timber villa.
- [30] P. Vago, 'Perret', in *L'Architecture d'Aujourd'hui*, 2nd ser. 3 (Oct. 1932), p. 15.
- [31] J. Guadet, *Eléments et Théorie de l'Architecture* (Paris, 1901), pp. 7 and 82–83.
- [32] T. Garnier was also influenced by Guadet. See M. Rovigatti, *Tony Garnier et la Didactique de l'Ecole des Beaux-Arts* (Milan, 1984).
- [33] P. Collins, *Concrete: the Vision of a New Architecture* (1959), pp. 159–160.
- [34] P. Collins, 'L'Architecture de Perret', in *A. et G. Perret* (Catalogue for exhibition organised by C.N.A.M., Paris, 1976), p. 23.
- [35] According to his biographers Perret had discovered Viollet-le-Duc at around the age of 10.
- [36] M. Zahar, *D'une Doctrine d'Architecture: Auguste Perret* (Paris, 1959), p. 2.
- [37] Photograph mentioned in *A. et G. Perret*, p. 39.
- [38] Perhaps because of military service.
- [39] P. Chemetov & B. Marrey, *Architectures, Paris 1848–1914* (Paris, 1976), pp. 1–6. The Faubourg Poissonnière building was published in *La Construction Moderne*, 2nd ser. 5 (7 April 1900), pp. 319–20.
- [40] *La Construction Moderne*, 2nd ser. 5 (24 Feb. 1900), pp. 244–5.
- [41] *La Construction Moderne*, 2nd ser. 3 (1 Dec. 1898), pp. 159–61.
- [42] According to Collins, the 'Louis XV style made to look younger by Art Nouveau'.
- [43] Cf. Collins, 'L'Architecture', p. 26.
- [44] Mayer alludes to an unfortunate speculation by Claude Marie Perret which could have led to financial ruin. It is probable that the construction of the building was meant to save the business by making maximum use of the site and by reducing building costs through the use of reinforced concrete.
- [45] S. Giedion, *Espace, Temps, Architecture* (Brussels, 1968), p. 217.
- [46] See A. Perret, Conference 31 May 1933, in *La Revue d'Art et d'Esthétique* (Paris, June 1935).
- [47] Buildings such as les Halles de Baltard and les Galeries des Machines des Expositions Universelles had already made the public aware of the lightness of skeletal metal construction.
- [48] A. Perret, 'L'Architecture', in *La Revue d'Art et d'Esthétique* (Paris, 1935).
- [49] Meyer, 'Perret', p. 53.
- [50] P. Jamot, *A. et G. Perret et l'Architecture du Béton Armé* (Paris, 1927), p. 5.
- [51] Collins, *L'Architecture*, p. 26.
- [52] See L. Benevolo, *Histoire de l'Architecture Moderne* (2 vols, Paris, 1979), 11, p. 81.
- [53] The Chicago School was also concerned from an early stage with questions of the skeleton, curtain wall and open plan. See Giedion, *Espace*, p. 238.
- [54] J. Gubler & J. Neuenschwander, 'Prologue à Hennebique', in *Monuments Historiques*, no. 140 (Sept. 1985), pp. 13–6.
- [55] See M. Emery, *100 Ans d'Architecture Moderne en France 1850–1950* (Paris, 1971).
- [56] In particular the pavilion of the Samaritaine and the famous Palais de Bois.
- [57] First called 'Entreprise Générale de Travaux Publics et Particuliers' ('General Contracting Firm of Public and Private Works').
- [58] Perret, 'L'Architecture', p. 46.
- [59] Jamot seems to be responsible on account of his '1905 Date Decisive pour l'Architecture du Béton Armé', in *L'Art Vivant*, 2 (1 Sept. 1926), p. 243.
- [60] It is about a curved triangle.
- [61] J. Posener, 'Architecture ou Construction', in *L'Architecture d'Aujourd'hui*, no. 158 (Oct.–Nov. 1971), pp. 42–3.
- [62] Cf. J. Abram, 'Classicisme et Béton Armé: Perret et l'Idéal Rationaliste du Béton Armé', in *Monuments Historiques*, no. 140 (Sept. 1985), pp. 5–12.
- [63] The Commemorative plaque fixed in 1950 on the house where Auguste Perret was born, Keyenveld Street in Brussels, pays homage to the one 'who first gave an architectural style to reinforced concrete'.
- [64] A. Perret, 'L'Architecture', p. 48. See also A. Perret, 'Architecture, Science et Poésie', in *La Construction Moderne*, 48 (2 Oct. 1930), pp. 2–3.
- [65] e.g. in such works as the Ateliers Esders or the Tour d'Orientation of Grenoble.
- [66] This essentialist conception of architecture had points in common with that of Le Corbusier. See J. Abram, *Modernité—Post—Modernité* (Nancy, 1981), pp. 47–55.
- [67] Cf. J. Summerson's analysis, *Le Language de l'Architecture Classique* (Paris, 1981), p. 111.
- [68] It seems it was Gustave who was in charge of the calculations for reinforced concrete.
- [69] Also Marine Nationale. See E. de Thubert, *La Construction Moderne*, 48 (2 Oct. 1932), pp. 4–14.
- [70] J. Abram, *Perret et l'Ecole du Classicisme Structurel* (2 vols, Nancy, 1985), pp. 69–78.
- [71] See B. Marrey, 'Qui est l'Architecte du Théâtre des Champs Elysées', in *L'Architecture d'Aujourd'hui*, no. 174 (July–Aug. 1974), pp. 115–25.
- [72] See also M. Dufé, *Bourdelle* (Paris, 1976), pp. 107–110.
- [73] A. G. Perret, 'Lettre à M. Pascal Fortuny datée du 8 octobre 1913', in *Cahiers d'Art Moderne* (Paris, 30 Oct. 1913), quoted by Jamot, *A. et G. Perret*, p. 83.
- [74] Perret, 'Lettre', p. 84.
- [75] This is particularly obvious in the study of churches by Perret.
- [76] This may be named the 'typological attitude'.
- [77] See J. Cottureau, 'Le building du Gouvernement Général à Alger', in *La Technique des Travaux*, 10 (2 Feb. 1934), pp. 75–84.
- [78] See 'Une Eglise en Béton Armé', in *La Construction Moderne*, 39 (2 March 1924), pp. 254–57; P. Jamot, 'Notre Dame du Raincy', in *Gazette des Beaux-Arts*, 65 (Sept.–Oct. 1923), pp. 190–210; Y. Rambosson, 'La Nouvelle Eglise ou Raincy', in *Art et Décoration*, XLI (Jan.–June 1924), pp. 1–7.
- [79] See Abram, 'Classicisme et Béton', pp. 5–12.
- [80] This attitude is not unconnected to the one studied by Panofsky, in *Architecture Gothique et Pensée Scholastique* (Paris, 1967), p. 112.
- [81] See Abram, *Perret et l'Ecole*, 11, pp. 64–77.