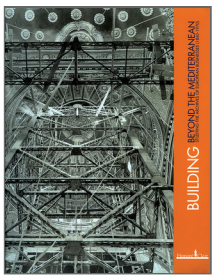

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Bridges as ambassadors: Hennebique's expansion in North Africa

Des ouvrages d'art pour ambassadeurs ? Les ponts dans l'expansion d'Hennebique en Afrique du Nord

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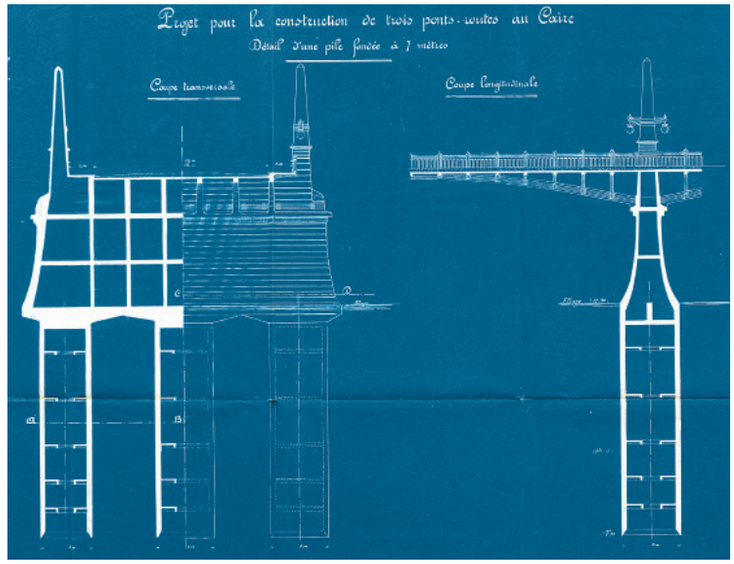
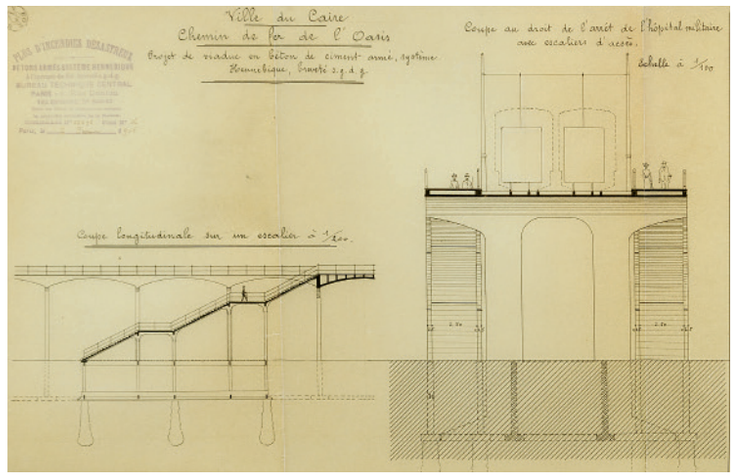
Bridges as ambassadors: Hennebique's expansion in North Africa

Guy Lambert

In contrast to the prominent position Hennebique generally granted to bridges in its advertising strategy, those built by the company in Northern Africa appear only occasionally in its publications and exhibitions. True, bridges were less representative than other types of projects of its activities on that continent. However, we may also wish to consider the extent to which they fit the image the firm wished to project. Despite the limited publicity Hennebique gave to such works, its sales agents and proxies expended considerable energy in situ, prospecting for projects and developing them. Of course, no potential contract was neglected. Nevertheless, the quest for major projects stands out from the design of smaller scale operations, and according to a 1906 letter, bridges are structures "with great publicity potential."[106] The desire to expand south of the Mediterranean here went hand in hand with the broader ambition of "conquering the Department of Ponts et Chaussées"[107] that François Hennebique had shown since his beginnings. Although railway companies and some industrialists were interested in reinforced concrete for the construction of their projects – especially in Egypt, where as early as 1903, the Parisian firm built two bridges[108] – it is in fact official recognition which counted the most. In a business sector dependent mainly on public authorities, it was probably simpler to build in a protectorate country such as Tunisia rather than in colonial territories, with a "narrow and puerile administrative formalism"[109] castigated by Hennebique and its representatives.[110] Thus in Algeria, where convincing civil engineers was as uncertain as in mainland France, the consistent efforts spent in this way were slow to bear fruit, as an agent regretted: "Unfortunately, as you can see, although there are plenty of projects (and how many of them have we dismissed!), completed constructions are rather rare."[111]

For all that, beyond the borders of Algeria, this observation could in reality summarize more broadly Hennebique's position in Northern Africa up until World War I. Whether or not these schemes were actually completed, designs proliferated. More than sixty projects were studied in Algeria before



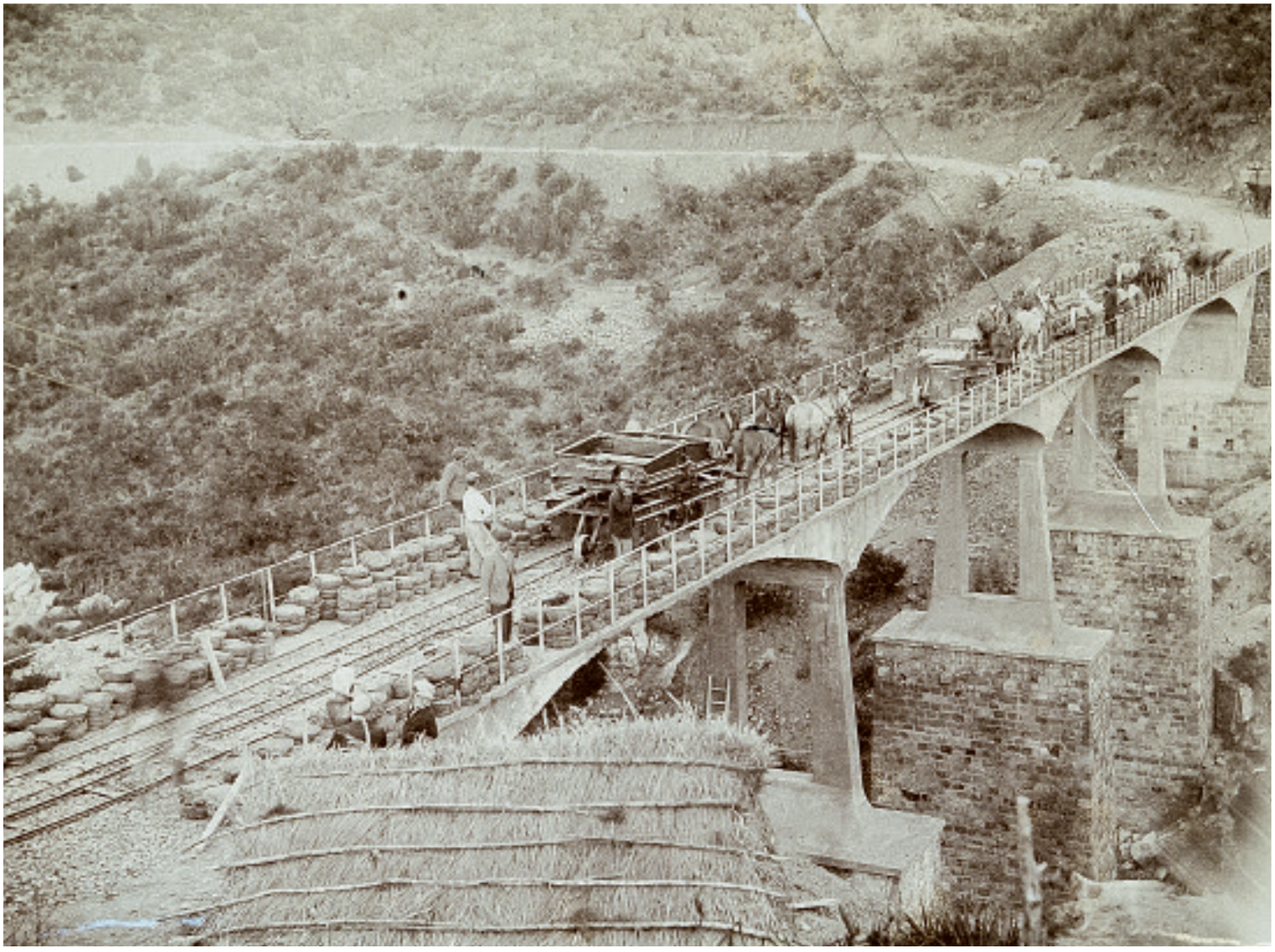


1914; about fifteen, in Tunisia; a dozen, in Egypt. Company policy was tried and true: in particular, it consisted of establishing its authority by producing quantities of design files. The profusion shows the productive strength of the Hennebique network and also highlights its adaptability to highly varied situations and, above all, its reactivity to the frequent redefinition of programs. But the course of project development also reveals that the organization was occasionally cumbersome. Its efficiency was sometimes hobbled

353-m bridge over the Nile, Cairo (1903), Hennebique central office, eng.: Detail of a piling sunk to 7 meters; Unbuilt project drawn for a competition

Railway overpass for Les Chemins de Fer de l'Oasis, Cairo (1906), Della Riccia, ing.; Hennebique, cont.: Preliminary design, unbuilt

Bridge over Malah wadi, Ténès, Algeria (1905-1908), Hennebique central office, eng.; Louis Didier and Société de Fondations par Compression Mécanique du Sol, cont.: Trials



by communications difficulties between participants, accentuated even more by distance. Often, a project fully designed in Paris arrived at the North African agency so late that the agent had to rush to meet the deadline to submit a bid – if it was not too late altogether. Regardless of the real consequences of tardiness, it was often a source of tensions between the central office and the sales network. Agents were frustrated when deals hovered out of reach, and the head office sternly hurried projects: for example, in 1907, it reminded the contractor in charge of the Ténès bridges that "the satisfaction given by the bridge will determine the future of reinforced concrete in Algeria."[112] This essay examines bridge production by Hennebique in Northern Africa, 1900-1910, in this light. In a context marked both by the firm's expansionist dynamic and by an official resolve to regulate the use of reinforced concrete, the strategies of

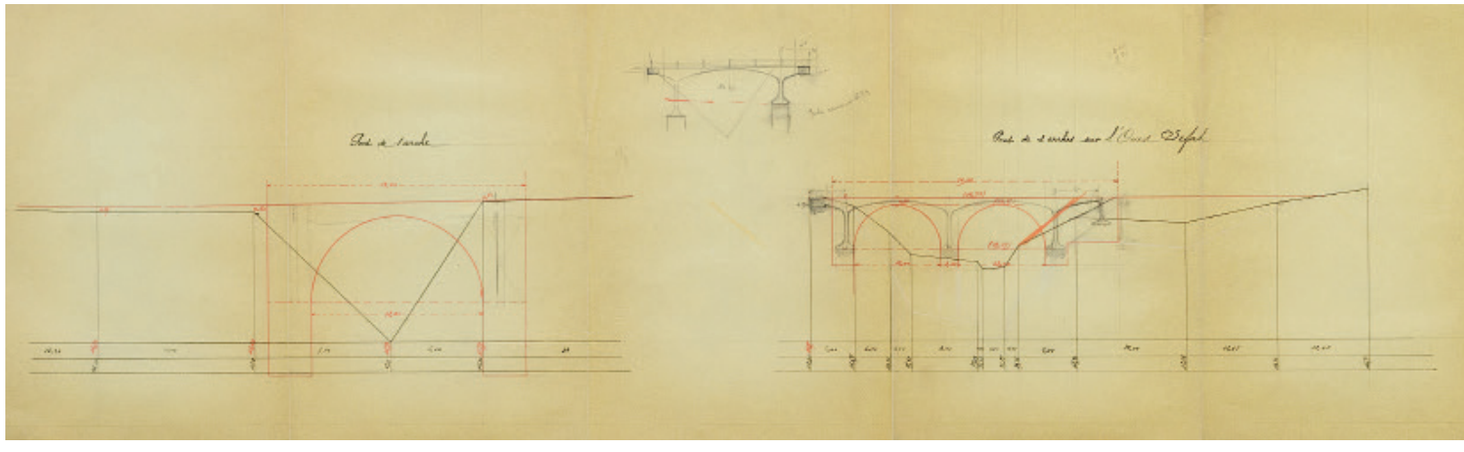
Bridge over Sefah wadi, Ténès, Algeria (1905-1908), Hennebique central office, eng.; Louis Didier and Société de Fondations par Compression Mécanique du Sol, cont.: Sketch of Hennebique project on print of previous project

persuasion at work, both in the design of the structures and in the preparation of design files, are worthy of attention.

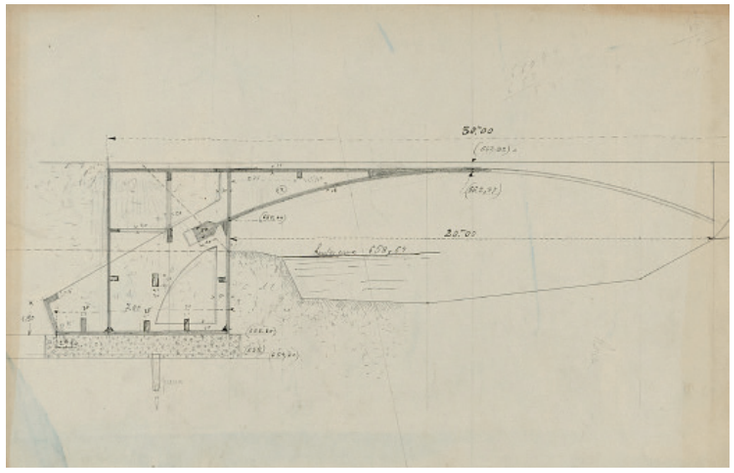
Breaking into the market: Hennebique's potential to adapt

Regardless of the impact of the "propaganda" developed by Hennebique,[113] the public authorities were undoubtedly more sensitized to the advantages of reinforced concrete in a geographical context where the flash flooding characteristic of a *wadi* frequently demolished structures, sweeping away steel decks and washing masonry piers away. Even engineers who were least inclined to welcome licensees or general agents supported the new material – for example, mentioning how quickly reinforced concrete could be poured, or its resistance to salinity, close to the sea – when asked for a price or project offer. Indeed, many engineers contacted Hennebique representatives with a project in hand, already designed by their own department – most often in steel construction – in the hope of "improving" it or, on the contrary, simply for the purpose of "comparing the systems as applied to entire projects."[114] Shaped by a culture of mistrust, Hennebique's usual practice sought to limit the risk of information leaks by sending only a draft, which moreover was not systematically accompanied by design specifications. Nevertheless, at a time when the perspective of regulation of reinforced concrete made Public Works more intransigent, this strategy of professional secrecy may not have been relevant. "This is a question of principle that must be answered. Should we satisfy the Algiers engineers, who demand to see construction drawings in order to assess projects?"[115] asked general agent Reymond in 1907.

The preference for private agreements was expressed at all levels of the Hennebique network. However, once public officials had Hennebique's plans and price estimates in hand, they were often likely to call for competitive bidding. This practice also lent itself well enough to the firm's strategy, especially when Hennebique intended "to break into the market for steel construction."[116] At a time when Hennebique still dominated the reinforced concrete industry, the art of the alternative plan, well known to entrepreneurs, was above all an opportunity to attract attention to the material. Thus, in entering the competition opened in 1903 for the construction of three bridges over the Nile, connecting the island of Roda to Cairo and Giza (the largest of which spanned 535 m), Hennebique observed that "the specifications, although they do not explicitly demand reinforced concrete, do not exclude it, either."[117] Henceforward, though Hennebique's sales pitch touched on the company's long experience – going back to the bridge at Châtellerault in 1899 – the main thrust of the argument was to disqualify steel from all points



Bridge over Damous wadi, Dupleix, Algeria (1905-1906), Hennebique central office, eng.; B. Reymond eng.; Louis Didier and Société de Fondations par Compression Mécanique du Sol, cont.: Detail of a span, unbuilt project



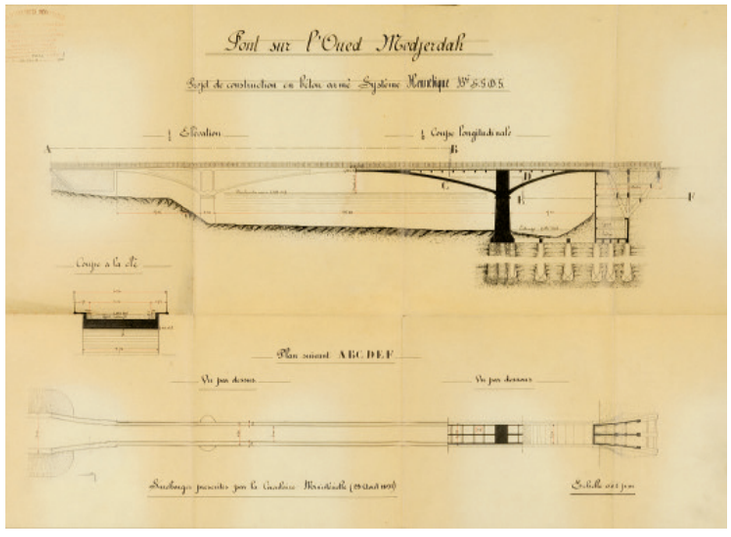
Bridge over El-Akoum wadi, Tlétat el-Douaïr station, Algeria (1910), B. Reymond, eng.: Preliminary design, unbuilt, sketch by B. Reymond

of view. For example, when a call for bids specified the "monumental character" of the planned structure, Hennebique asserted "it is a well-proven fact today [...] that steel construction is not architectural"[118] (in contrast to the potential of reinforced concrete), and furthermore, the quest for monumentality "does not always lead to excessive spending, especially when the engineer-architect uses the [reinforced concrete] judiciously."[119].

The range of constructions encountered in the projects submitted by the Hennebique network fundamentally reflects the diversity of technical and commercial cultures of the players. Indeed, design often seems like a collective process, in which the summary draft prepared by the local agent or by a contractor – on the basis of his own views and sometimes quite independently – constitutes the basis for the Paris office's designs. The manner in which each party envisaged reconciling technique, economy, and esthetics sometimes shows differences in strategy. The plans themselves also attest to these interpretations, if only through the series of different solutions for the same project. If among the Hennebique agents a taste for arched bridges, or at least for the refining of arches, can be identified, other types of structure were also chosen, determined by the constraints of the site, by the cost, or simply by the skill of the contractor who had won the contract. Thus for the Lamy Bridge in Constantine in 1905, Reymond regrets, like his contacts on the rue Danton, that the contractor had presented a plan for a bridge with girders rather than the one designed by the head office: "The form with an arch would have had a far more preferable appearance and I am convinced that it would not have resulted in extra expense, but Mr. Didier, to whom I had given the task of dealing with the mayor, judged differently."[120] The plans also illustrate a transposition into reinforced concrete of types from construction in steel, such as the cantilever bridge or the tied-arch or bowstring bridge. This last type of construction, implemented as early as 1906 in a bridge over the Beja wadi in Tunisia (40 m span), occupied a privileged position in Hennebique's production. But at a time when *Le Béton armé* columnist Paul Gallotti was castigating these forms, for the issue was competing with the beauty of steel construction,[121] this structural type was sometimes adopted only as a last resort, especially when the subsoil made it impossible to establish abutments able to resist lateral thrust. If the question of foundations is moreover very often crucial where clay is the dominant substrate, Hennebique again had an advantage when hoping to prevail over its competitors. The fact that it held a patent on a system for deep pile driving ("Compressol"), through a company it had taken over in 1902, was a strong argument for an "all-concrete" solution that could enable Hennebique to win contracts by concentrating tasks. For example, the case of the bridge on the Medjerda at Sidi Zehili in Tunisia shows how these different factors affected the design of the structure, for which three solutions were studied successively between 1907 and 1911. First, a plan for a three-arch bridge was drawn up, for a privately agreed contract. When

Bridge over Béja wadi, road from Medjez el-Bab to Souk el-Arba, Tunisia (1906-1907), Hennebique central office, eng.; Jean Peloni, cont.: Construction site

Bridge over Medjerda wadi, Sidi-Zehili, Tunisia (1907-1911), Hennebique central office, eng.; Jean Peloni and Société de Fondations par Compression Mécanique du Sol, cont.: Project for cantilever bridge, 1908



competitive bidding was opened instead, Hennebique's engineers preferred to submit a cantilever bridge (with a central span of 56 m). This change required the use of Compressol for the pilings and therefore the services of the Hennebique subsidiary Fondations par Compression Mécanique du Sol. The latter company finally obtained the contract in its entirety after the withdrawal of the initial agent (Peloni), who had brought the business to Hennebique but missed the deadline for submitting a bid. During the works, the form of the structure was changed significantly for reasons that are not clear from the archives, but which could be connected to the composition of the soil. The deck finally consisted of bow-strings resting on the two pilings already under construction, and raised, as well as on a newly driven median pier.

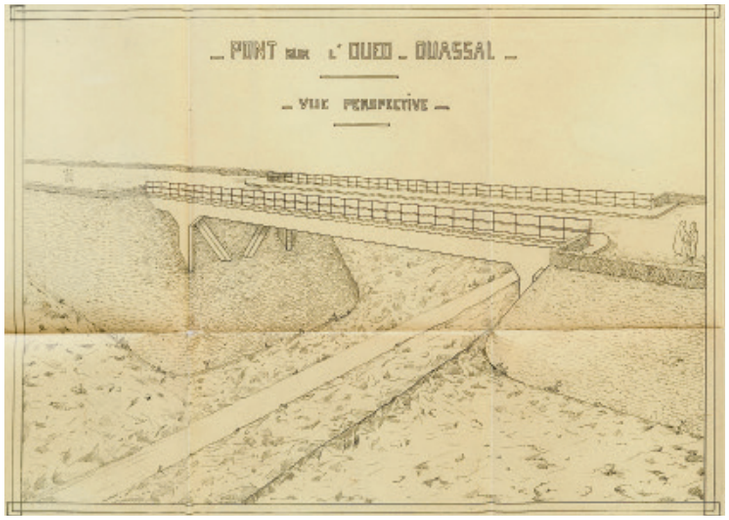
The "rational, ideal solution"[122]

The range of bridges designed by Hennebique exemplifies the adaptability of reinforced concrete, constantly touted in its advertising. However, the media campaigns organized from 1905 in the bridge industry tended to focus more specifically on the formal or esthetic qualities of the new material. The idea was that reinforced concrete was the most suitable and rational material for the architecture itself of these works, which were the quintessence of rationality, at least as characterized at the time. Several key operations in Hennebique's expansion in Northern Africa attest to this approach, being connected with emblematic projects and constructions the company then used for its prestige and ambitions. Thus, in 1905, the plans for a bridge over the Damous wadi near Dupleix, Algeria, and for a road overpass at Gabbari train station in Alexandria, never completed but each presented as the firm's "first major feat of engineering" in the relevant countries, reflected the aura of the Mativa Bridge built in Liege, Belgium, for the world's fair there the same year. It was more than a question of image, as Hennebique's engineers seemed to pursue the Mativa approach in other projects. The design's public success was obviously an asset to Hennebique's representatives in their dealings with government civil engineers, who had only recently been won over to reinforced concrete. But the lines themselves of the new bridges derive from an aspiration to produce "20th century bridges."

The series of plans for the bridge over the Damous wadi (total length 200 m) shows the scheme being

Bridge over Medjerda wadi, Sidi-Zehili, Tunisia (1907-1911), Hennebique central office, eng.; Jean Peloni and Société de Fondations par Compression Mécanique du Sol, cont.: Completed tied-arch bridge

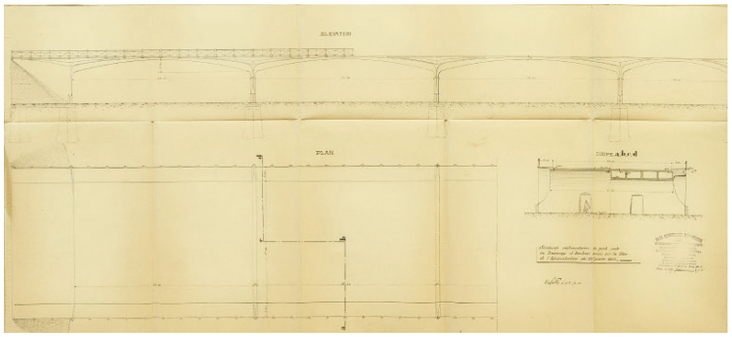
Bridge over Ouassal wadi, Mateur, Tunisia
(1913-1914), B. Reymond, eng.: Perspective



simplified significantly. Hennebique's initial proposal in October 1905 derived from an earlier steel-deck bridge project established by the authorities. While retaining the number of piers and their rhythm, the Parisian office designed a five-arch bridge suggesting it was made of stone. This satisfied the government engineers, who objected only to "the thinness of the key, for esthetic reasons, not because of strength."[123] Yet the following month, a completely different design was prepared by the offices in Paris: the planned abutments were replaced by half-spans conceived on the principle of the cantilever. This structural change was accompanied by a general refinement of the bridge's lines: the proportional relation between the breadth, now significantly reduced, of the piers (50 cm) and the opening of the arches (between 24 and 40 m depending on the hypothesis) are more reminiscent of the Passerelle des Arts in Paris than of a stone bridge. These changes seem to be less the result of the client's request than of a new philosophy at Hennebique. Handwritten notes on a reproduction of the first blueprint, requesting radical corrections, summarize the guidelines: "Keep the opening wide. Don't obstruct it with piers. With reinforced concrete, they can be made very *thin*. They are thus less likely to cause a washout, and are also less expensive."[124] Although the comments were strictly "in-house" at the firm, they are the exact echo of the rhetoric developed at the time by Paul Gallotti in *Le Béton armé*. In November 1905, he put forth the same idea to assert the superiority of reinforced concrete over other building techniques.[125] Repeating the argument in the magazine in April 1906, Gallotti invoked the authority of 18th century École des Ponts et Chaussées founder Jean-Rodolphe Perronet. According to the author, he "admirably defined the true esthetic of bridges: obstacles reduced to a minimum in the riverbeds, arches, just what is needed to support the lintel, the flat stone which must constitute the roadway, no useless superfluities, everything that cannot be justified being irrational."[126] Gallotti's interpretation of Perronet's precepts naturally leads him to conclude that Hennebique's Mativa Bridge in Liege is "the epitome of the ideal bridge Perronet dreamed of."[127] But as a critic, Gallotti also commented on other bridges Hennebique was building at the time. For example, he admires "cut-waters shaped like plowshares,"[128] for their naturalism, echoing the spirit of the design for the bridge over the Damous wadi.

Intended to cross railway tracks rather than flowing water, Gallotti's comments on the overpass at Gabbari Station in Alexandria, 1905 seem to reflect the same reasoning. If its overall thinness results primarily from the need to find a compromise between the size of the trains and the rather low level of the street above, it undeniably shows architectural intentions about issues going well beyond merely wooing the contracting authority. Clearly, the configuration of very slender piers in the construction lends itself admirably well to the discourse on the potential of reinforced concrete: though their breadth of 60 cm is a "concession that we make to esthetics," it does not weaken them in any way. Were a train to derail, the author says, the locomotive "would simply smash like an apple thrown on a rock."[129]

Gabbari Station street overpass, Alexandria (1905), Hennebique central office, eng.; Émile Servin, eng.; Léon Rolin & Padova, cont.: Unbuilt project, plan, section, and elevation



An acculturation at work?

The role of builders in the popularization and official acceptance of reinforced concrete no longer needs to be shown. Hennebique's design files, studied here, show some of the methods by which this process worked. It is noticeable even in the daily routine of the various figures of the building industry, from contractors to the public services. Thus, at the beginning of the century, a technical culture identifying with the firm was constituted, not only by the head office in Paris, but also in response to a demand from the agents themselves, faced with learning the new science of reinforced concrete. A request from the Egyptian agent, Émile Servin, in 1909 shows this: "I would be grateful if you were to ask Mr. Serra and Mr. Dufour if they would be so kind as to study in detail the calculations for the bridge as I have planned it for both methods, the Hennebique method and the official one, so that in the future, I will no longer be taken as I have been this time, and that I can present a bid that conforms to the requirements without your assistance. For this, please do not spare me any explanations because in the calculation of the arches there are points which I have never fully understood and I am always uneasy when I have to apply them."[130] Although the letter is primarily related to the communications dysfunctions slowing down the transmission of information and plans within the Hennebique organization, it also reveals an aspiration to greater autonomy, equally beneficial to the agents themselves and to the head office. But the share of acculturation resulting from the firm's communications is even more obvious when it is reflected in standards and codes by government civil engineers. As Reymond pointed out to his supervisor in 1907: "the program, except, however, as regards the breadth of the piles and the application of the memorandum on reinforced concrete, is inspired from your own teaching. In fact, Compressol is first on the list of construction-foundation processes."[131] Is this not precisely a victory of the strategy developed by Hennebique, promoting an identification with the materials it produces?