The “Frame Vaults” of North Italy between the Sixteenth and the Eighteenth Century

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ABSTRACT: The compound and complicated vaults, built by a segmentary and policentrical arches, whose bear smaller flat vaults, are especially known as masterpieces of the Piedmontese architecture in the seventeenth and the eighteenth century. But there is almost unknown, that at the same time this pattern is largely diffused in the North Italy, chiefly between Cremona, Mantua and Brescia up to Verona, and here it is attested until the end of eighteenth century. In the second half of fifteenth century the pattern reproduce in brick the wooden floor: the arches are transformed in a pair of consoles that shorten the free span of a beam (Uggeri Palace, Brescia). By them, it’s possible to cover any great spaces, with more as eight meters span and to realized flat surfaces for the frescoes, inside a frame decorated by stuccoes. These vaults are a feature of the masonry construction analogous to the “trompes” or the “escaliers suspendus” of the French stereotomy. They are often connect by the written sources to the activity of the builders of Tessin, and they appear as the result of an empiric practice, out of the intellectual echelons of the treatises of architecture, with the partial exception Guarini’s.

Composite vaults, in which a framework of segmented or polycentric arches supports the minor vaults, usually flat, can be found mainly in the Piedmont architecture of the 16th and 17th centuries, and are to be related to the most audacious edifices by Guarini or to some buildings by Vittone or ascribed to Juvara’s genius. What is less known, is that it had been a widespread pattern for more than a century in northern Italy, particularly in provinces of Cremona, Mantua and Brescia, and it is attested in the whole Padan area until the latest years of the 17th century. These vaults are a pattern of brickworks such as the ones called trompes or voutes plates in French stereotomy. From the point of view of construction and use, there are many advantages: a complete centering is not required; arches only need scaffolding, and in limited portions the minor vaults can be built at later times, by using as a support a flat boarding, on which mild slopes can be created just by using a little sand. The trust of the arches, as the one of the whole vault, may be restrained by extradossal tie beams whose iron rods are walled from the inside, in order to hinder flexure and improve working. In this way, the rise can be shortened (keeping the same span) avoiding both dark areas so that edifices can be increased in height. Minor vaults are usually built with one of bricks and often flat laid reducing the quantity of materials and, consequently, weights and costs. On vertical walls, windows that rise to the height of minor vaults, can be created into the space that originates between the arches, thus improving the natural lighting. The flat surfaces may be covered with frescoes, while on the arches shaped bricks or plaster works create elaborated mouldings, following the classicist rules that state that vaults should not be completely covered by frescoes, in order to point out the structural details of buildings. This kind of structure offers all the advantages of a wooden ceiling, even in the most elaborate version, called a cassettoni: in the middle of the 15th century, when the first examples of this brickwork appear, the making of wooden ceilings becomes progressively more difficult, due to the increasing lack of materials suitable for panelling very wide spans (six metres or more). Philibert Delorme’s boarding frames, whose wooden ceiling plans seem to be akin to framework vaults, are an answer to the problems of finding the right materials. The transition from wooden ceilings to brickwork, often looks like an imitation. For instance, the little office of Guglielmo Gonzaga, the Duke of Mantua, in the Palazzo Ducale was covered by a wooden ceiling, whose beams were walled and supported by big brackets, this being a development of the ones in carved wood or stone (the latter being more common in the Verona area). They were placed under the beam heads on double framed ceilings and were meant to reduce open span and to give an extra safety support helping avoid walled wooden heads wearing out. There is a drawing that brings this back to our memory: it was probably bought by Lord Burlington at the auction of the collections of the last Duke of Mantua of the Gonzagas, Ferdinando Carlo. Such drawing then served as a model for the Velvet Blue Room ceiling in Chiswick House (Harris
1994 p 161), ascribed to William Kent who had seen the Gonzagas’ Palace (Sicca 1986). In fact, it is not the only one: there is an older example in Brescia, in Lana’s mansion; the same patterns can be found in several wooden ceilings in Cremona at the end of the 15th century or beginning of the 16th: they were so common that is worth mentioning the ones of two adjoining mansions in Cremona, Bartolomeo Ariberti’s and Ettore Persichelli’s.

Antonio Maria Viani reproposes the same wooden sculpture in the grand Sala degli Arceri (1614) in the Ducal Palace of Mantua (Carpeggiani 2003). Large stucco hermas, looking like brackets, are placed near the heads of the composed beams which have a span of 16 metres. These hermas may have been added by Antonio Galli Bibiena in the mid 1700’s, along with the caned ceiling that covers the wooden structures and the wall decorations. Viani reproposes the same masonry design at a smaller scale in the Galleria del Passerino (SIGNORE 2003). This solution is not archetypical: in the Palazzo Uggeri (nowadays Palazzo Biondelli) in Brescia, the ground floor hall is decked with a vault which can date back to a period no later than 1580’s. According to the Count Fausto Lechi (Lechi 1979, vol. III, pp. 40-45.) the building of Palazzo Uggeri on via Musei can be ascribed to Gio, Maria and Alessandro Piantavigna, architects and businessmen. Four pairs of cyma reversa brackets on either side of the impost quadrangle, appear to support a frame that delimits a central field. The pattern is the same of Guglielmo Gonzaga’s studiolo, and the difficulty in adapting that design to a rectangular scheme shows that the builder was thinking about some model that he did not master. The extrados, covered by the upstairs flooring, is not visible. The brackets correspond to both the pairs of transverse arches parallel to the shorter sides and to the further two pairs of major arches, that probably intersect beneath the plastering. The fields are framed by little shallow vaults. The stucco reliefs conceal the true structure. Palladio’s collaboration, reported by the older guidebooks, cannot be confirmed, naturally, but suggests that as early as the Modern Age, cultivated references could be appreciated in the building. This example is not isolated and it is not certain that it should be the earliest. Taking only published cases into consideration, the Palazzo Uggeri scheme is carried out with improved regularity in the ground floor hall of Casa Peroni Lombard (Lechi, 1979 vol. III, pp. 177-180): the large brackets are shorter in the shape of a semicircle, and on their extrados hermas are moulded in stucco. These brackets appear at regular intervals, around a central panel with a span almost twice as long as that of the little vaults between the brackets. A rich stucco frame evens out the step between the lower side of the brackets and the panel background on which a fresco by the Rosa’s is painted.

A simplified version of the scheme survives in the house previously known as Casa Martinengo della Mottella on via Pace (Lechi 1979 vol. III, pp. 233-234). Again in the vault of the great hall of the Palazzo Nigolini in Azzano.

Figure 1: Palazzo Roncadelli Manna, Cremona: the entrance - hall vault

Figure 2: Palazzo Soncini già Feneroli a Provezze.: the vault of the main hall (picture and building structure)
Mella (Lechi, 1979 vol. IV, pp. 360-365), the central panel with the remnants of Gambara’s fresco, confirming the approximate dating around the mid 1500’s, has a span three times as long as that of the little vaults along the walls. These little vaults come one after the other, always identically shaped as nearly perfect squares, separated by pairs of semicircular brackets that are covered by a layer of stucco creating two volutas at the ends. The result is a sort of depressed vault. The theme of telamones and hermas made of stucco on the brackets is found again in the hall of Casa Bornati in Bornato (Lechi, 1979 vol. IV, pp.) which also dates back to the mid 1500’s.

In Cremona, the inventories having as a subject the houses of aristocracy, do not offer as detailed an account. Cases similar to the Brescian ones, probably referable to the late 1500’s, generally cover smaller spaces: it suffice to mention a little room on the ground floor of the Palazzo Barbò (built in the 1500’s and transformed in the 1800’s) on via Palestro; a similar one in another Palazzo Barbò on Corso Campi, also built in the 1500’s; another little vault, perhaps dating back to the late 1500’s, in the former seminary, previously monastery of Santa Margherita. A larger scale example in stuccoes and frescoes is still on the ground floor of Palazzo Trecchi, even after the works carried out in the 1800’s.

On the other hand, every attempt to provide an inventory of this type of vaults in the 17th century, even a partial one, is hardly significant, given the extremely widespread presence of this pattern. It is more useful, particularly for the area between Brescia and Cremona, to try and make a more detailed classification of it.

The entry vestibules were sort of corridors that lead from the road into the courtyard porches, before the use of vast entrance halls on columns develops, especially in Brescia, starting from the end of 1600’s. Arch-framed vaults become used in place of the groined barrel vaults typical of the 15th century to deck those much elongated rectangles. Already at that time the rise of the vaults was very limited in comparison to their span and the barrel cross-section described a polycentric arch. As the arch-framed vaults began to be used, the brackets with a nearly semicircular cross-section were connected to a central flat vault. Centring were thus built in correspondence of the arched and a flat plank with a thin sand profile was placed at the central vault. The vestibule of Palazzo Roncadelli Manna in Cremona, built after 1675 by the master mason and architect Camillo Capra and Francesco Pescaroli (Petracco 1998 p.p 187 – 188), provides a very comprehensible example of this type of building scheme, particularly due to the lack of décor (fig. 3). Several more elaborated examples are found in Brescia, with twin brackets and central fields delimited by rich stuccoes frames: from


Covering larger spaces is structurally more challenging. With the increasing rarity of good construction wood, building vaults becomes mandatory. Starting from the mid 1600's the wooden floors, which had already disappeared from the ground levels of aristocratic houses during the first half of that century, become rare throughout the Po Valley, even at the piano nobile, or else are substituted by ceilings of plastered canes shaped into mock vaults, whose light plank structure is an elementary version of Philibert Delorme’s carpentry. When the shorter dimension of a room is more than 7 metres, there is no other choice. Much depressed segmented or polycentric arches are used to produce a kind of arch-framing. These are covered by stucco reliefs terminating at the two ends in volutas like the echinus of Ionic capitals. The rise-span ratio is certainly dependent, when working on pre-existing features, on the need to abide by the heights of the wooden floors surviving in other parts of the same building. In this respects the rooms in the Northern wing of above mentioned Palazzo Roncadelli Manna are peculiar (fig. 4), as much as also the refectory of the monastery of the Gerolomini of San Sigismondo, built after 1658, probably by order of Camillo Magio (upon Camillo Magio Petracco 1998 p. 178) both in Cremona and likely by Francesco Pescaroli.

In the Monastero the proportions of the much depressed vault are constrained by the height of the pre-existing elements, probably a groined cloister vault or a floor, and made it possible to preserve the Western wall fresco dating 1500's. In the Cremona buildings, in order to limit the lateral push, there is an attempt to decrease weight by building little vaults in folio or at most of a single head. The contrasting load is left to the thickness of well-worked brick perimeter walls or to the counterpush of the vaults decking lesser halls. The simple iron ties, rarely included within the vault thickness near the keystone, allow for a more general cohesion of the flanking vertical walls but are not specifically designed in relation to the different elements (arches and vaults) or their structural roles. Thermographs taken at Palazzo Roncadelli Manna display only two ties located within the surcharge layer above the vault, at irregular intervals, without any relationship with the arches underneath. A peculiar adaptation to the local building tradition is displayed by the use of clay mortar in the great ground floor vault of Palazzo Visconti,(Azzolini 1998 pp. 104-115)an 8m side square, probably dating back to the late 1600’s re-building. The push due to the depressed arches, which detach from the central square worked in concentric lines of a single brick head, is balanced in this case by the ground reaction. Clay must not set to make things easier during dismantling.

On the contrary, in the many examples known in Brescia and surrounding areas, the construction of the vaults and the role of ties are tightly linked. The vertical walls are in unsquared stone and less regular. Iron is more readily available than elsewhere, as the valleys right north of the city were the most important iron-making centres in Lombardy during the so-called Antico Regime. Villa “La Palazzina” in Pontevico (Lechi 1979 pp. 335-38, Perogalli et alii 1969 pp.378-379) presents two large arch-framed vaults, the first in the entry hall, the other one in the lateral grand hall, boasting rich 18th century decoration, although in either cases the extrados is not visible. Palazzo Fenaroli (later Sconzini) in Provezze (Lechi 1979, vol V. pp.46-49) still preserves a room 7 by 10 metres, reaching up, with its height of 8.5 metres, through both floors of the building, fulfilled between 1641 and 1687. The construction can be perfectly observed from the attic; the large brackets, four along the longer
walls, three along the shorter ones, support the impost of the cloister vault that occupies the central square. The lunettes between the brackets are closed by the usual nearly flat little vaults. The impost is formed by segmented arches pushing between pairs of brackets, and the two brackets at the centre of the two longer sides are linked to create two arches serving as the rib to the cloister vault, and are in turn connected to the semi-arches, which prolong the two brackets at the centre of the shorter sides. All vaults are of a single brick head while the arches are of two heads. On the shorter sides the brickwork is irregular and the little vaults partly over ride and partly are inserted between the brackets. On the Northern side, the depressed arches are substituted by a wooden beam, included within the wall, which acts as the impost. The extrados ties are located in correspondence of the two central arches and are made up by an upper rod going from wall to wall that is inserted at the keys. Two curved bars are found, instead of the 45° oblique rods, which are always within the thickness of the arch and of the brackets, following their curvature. At the ends, a single tie rod links respective tie ends. Rather than contrasting the vault push, the bars contribute to enhancing the frenello function imposed on the brackets. A similar system is applied to vaults whose intrados is a canonical cloister vault side when proper frenelli are added to the extrados, often including the tie. Arch-framed vaults can sometimes be sided by vaults looking like cloister or depressed vaults when seen from the intrados.

The use of this type of vaults does not subside with the coming of Neoclassicism. On the contrary, the most famous architect in late 1700’s, Faustino Rodi (see Bellini 1995 pp. 18-19), re-proposes them in several occasions in the gallery, near the great staircase of the Palazzo Comunale, demolished in 1921 (Jean 1998), and in the vestibule of the Scuderie Silva (formerly Casa Trecchi) in Santa Lucia (Bonfanti, Meroni, 2008 p.22), that repeats this constructive scheme. The voluntary coming-back to the 1500’s, to the wood archetype, is evident from the cyma reversa twin brackets connected by fascias, which are constructively segmented arches, while the fields are filled with little vaults in folio, the “voutes catalanes” dear to Conte d’Espie and certainly known to Rodi. In the ground floor hall of Palazzo Vidoni, a square of around 8 metres by 8, made up for Luigi Archinto, Rodi probably re-interprets a pre-existing elements on a square of over 8 metres of side (Jean 2000, pp.111-112). A drawing of a large arch framed vault with large brackets, maybe designed for a hall of Palazzo Cattaneo in Sant’Omobono (ASCr q) , was retrieved in the Ala Ponzone Cattaneo archives. This could be alternatively attributed to contemporary Luigi Bianzani, who worked on the Guissola villa for Gian Francesco Ala Ponzone (Perogalli et alii 1973, p.415) . In this villa is found a similar vault.

Conclusions
This repertory of constructive types is not yet a topography of the preserved examples. The archival search will again look for reconstruct the practical raisons of the statement of this singular pattern, he could more explain the diffusion area and perhaps his means. The short bibliography, that contains only historical references, testifies the absence of attention for this unusual construction, also if her knowledge could made to find again a neglected part of architectural and a news manner to read it.

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