Towards the end of the 15th century appear in France the first buildings inspired by the Italian Renaissance. Before the experience of Fontainebleau (around 1540’s), where important artists such as Rosso Fiorentino, Francesco Primaticcio, Sebastiano Serlio and Jacopo Barozzi da Vignola will be working, Italian artists active in France are generally relegated to an advisory role, as is the case of Fra Giocondo in the reconstruction of the bridge of Paris, (1499–1500) or to works of a decorative character, in the case of Domenico da Cortona.

These artists, originating from the court of Naples, followed the king Charles VIII in France in 1495 (Montaiglon 1851–52; Fillon 1851–52, Lesueur 1929; Ciotta 1985). Sculptors like Guido Mazzoni, Antonio Giusti, Pace Gagini, Lorenzo da Mugiano, painters like Andrea Solario and Girolamo Torniello, and cabinetmakers like Riccardo da Carpi, contribute to the diffusion in France of the stylistic and cultural innovations elaborated in Italy during the 15th century. Under this influence French maitres-maçons, trained in the masonry tradition of the cathedrals’ building yards, create new «forms» inspired by the Italian Renaissance but executed by French hands. The new architectural language, stimulating the comparison and the blending of two different cultures, leads to the invention of new types of decoration and forces an adaptation of building techniques to the new aesthetic and cultural requirements. All these factors assume particular evidence in the domain of the arched covers.

The evolution of the French technique of stone construction has been analysed in full detail by Pérouse de Montclos ([1982] 2001). He has also focused on the numerous and particular shapes that the arched cover has been given in France in the 16th–18th centuries. My research is based on his findings.

The survey begins with the analysis of a new type of cover devised by French builders which intersect the gasket-vault and the panelled wood ceiling. By observing a series of vaults realized in the north of France during the first half of the 16th century, it is possible to notice that, besides a generic desire to imitate the formal solution of the Italian covers, considered to be at the artistic vanguard, the motive of the coffer has a remarkable fortune, since it lends itself very well to be repeated as the recurring element in a regularly decorated field, apt to satisfy the French bent for ornaments.

The adoption of similar shapes collides with the traditional use of the rib-groined vault, characteristic of the flamboyant architecture of that period. The structural solutions reached in the ancient regions of Normandy and Poitou had solved the problem by stretching the constructive logic of gothic architecture to its extreme consequences.

The example just mentioned above, part of a wider research on the new types of covers realized with traditional techniques and materials, points to several solutions: from the great basket-handle vault with orthogonal branches and stone flags (voûte en
berceau en anse-de-panier à dalles sur nervures) of the castle of Chambord, particularly diffused in Touraine and Val de Loire, to the flat stone ceilings supported by a series of small arches, characteristics of the castle galleries of the Centre, the Poitou and the neighbouring regions, but used also to cover aristocratic chapels, and finally, to the so-called voûtes-plates dallées, diffused especially in Normandy.

There is no exact translation of voûtes-plates dallées; first of all because they are not real vaults. They are a flat stone cover, resting on a supporting structure, generally part of a rib-groined vault, with branches and diagonal ribs, called arc-diaphragm, namely screen-arc. These are the ribs of a pointed vault, from which the groins have been eliminated and in which a parting wall supports the flat cover. Therefore, the screen is the parting wall that discharges the cover's weight on to the arches. Sometimes this parting wall can be completely fret-worked and reduced into a series of ribbings or little columns which channel the forces and distribute them on the arches.

This type of cover is completely different from the straight vaults based on the system of the flat arch, (voûtes-plates clavées), used already in the 12th-13th centuries in France (Reveyron, 1993), since the stone ceiling is supported by the arc-diaphragm structure, considered as a trilithon, without offering any static collaboration (Pérouse de Montclos, 1982 2001, 162–163; Pérouse de Montclos 1989, 274). The covers of the Center and the Poitou are totally classifiable like voûtes plates dallées, even if the formal results are completely different from those of Normandy. In the case of square or rectangular spaces, characterized by short dimensions (up to 5 meters), the arc-diaphragm becomes ribbings, which form a series of supporting segmental arches, disposed orthogonally to the bearing walls. The stone slabs of the ceiling rest on this thrusting system. The presence of more segmented arches, placed parallel to the bearing walls, serves only a decorative purpose, to create regular ornamental fields, similar to Renaissance wood coffers. This type of cover characterizes the galleries of the castles of La Rochefoucauld (1518–1533), of Dampierre-sur-Bouton (half of 16th century), of the hôtel d’ Escoville in Caen (1532–15409, of the western porch of the castle of Chambord (from 1540). It is also used in the stairs of the castles of Azay-le-Rideau (1515–1518), Poncé-sur-Loir (1542) and of the hôtel de Pincé in Angers (from 1523). In the case of galleries and arcades, often some greater arches are extended to cover all the clear passage of the gallery, subdividing the space into regular spans.

In all these cases, even if the buildings present some Renaissance ornaments, the covers still respond to the gothic construction logic, entrusting the bearing role to the ribs and discharging completely the stone surfaces, which are left only with a decorative function. Viollet-le-Duc does not hesitate, in fact, to place them in the tradition of French construction history, as the extreme expression of the gothic constructive system:

Les Normands, les Manéces, les Bretons, firent volontiers des voûtes composées, soit de grandes dalles appareillées, décorées de moulures à l’intérieur, se soutenant par leur coupes, sans le secours des arcs, soit de plafonds de pierre posés sur des arcs [. . .] Le système des voûtes gothiques devait en venir là, c’était nécessairement sa dernière expression. Fermer les les intervalles laissés entre les arcs par des plafonds, et, au besoin, multiplier les arcs à ce point de n’avoir plus entre eux que des surfaces pouvant être facilement remplies par une ou deux dalles, c’était arriver à la limite du système (Viollet-le-Duc, [1854–1868] 1997, 4: 122–124).

In this instance my analysis will focus on the voûtes-plates dallées which use the branches of a rib-groined vault, and on the evolution of this type of cover in Normandy during the first half of the 16th century.

The first two Norman buildings employing the voûtes-plates dallées are the porch of the Saint-Etienne-le-Vieux church in Caen and the lower chapel of the castle of Gaillon. These two covers can be considered the prototypes of the structure that I propose to analyse. In both cases the buildings are in bad condition and it is very difficult to visit them. In 1944, the church of Saint-Etienne had been strongly damaged during the six months of bombardments after the landing in Normandy and no repairs are envisaged yet; the castle of Gaillon, stripped of all its sculptures during the French revolution, has been transformed in jail in the first years of the 19th century and restoration work has started just recently.

The lower chapel of Gaillon was constructed, most probably, by the maître-maçon Guillaume Senault,
already active in the castle of Amboise, in Touraine. In 1504 Richard Joury provides some centerings for the cover (Deville, 1850, 109); we ignore whether the larger and magnificent upper chapel had the same type of cover (Huard 1926, 26; Pérouse de Montclos [1982] 2001, 162) or a traditional rib-groined vault (Bardati 2002, 135–139).

The lower chapel has a nave with a five sides apse. An external gallery surrounds the building and continues along the northeast side of the castle, constituting an exterior ambulatory, accessible from the north flank of the chapel. The nave and the ambulatory are covered by the *voûtes-plates dallées* system. The *arc-diaphragm* present a full parting wall, whose horizontal mortar beds totally correspond to those of the boundary walls of the chapel, Figure 1.

![Figure 1](image1.jpg)

*Figure 1*

Castle of Gaillon (1498–1510). View of an *arc-diaphragm* of the lower chapel

Above the horizontal slabs rests the wood frame of the first floor deckhead, as we can see in the ambulatory, where some stone flags have been lost. Instead of what is written in the numerous descriptions of the castle of Gaillon (Bardati, 2002, 119–120) the lower chapel has no decorations, circumstance that does not help to understand the presence of the *voûtes-plates dallées*. A hypothesis attributes this absence to the vicissitudes of the castle during the French Revolution and to the consequent loss of the greater part of the ornamental elements: in fact, the fine carved stone fragment conserved in the lapidary warehouse of the castle could come just from the cited ambulatory, Figure 2.

![Figure 2](image2.jpg)

*Figure 2*

Castle of Gaillon (1498–1510). A sculpted panel from the lapidary warehouse

This panel, with its quadrangular fields bordered by ribs and decorated with bas-relief, seems to reproduce a coffered wood ceiling, not dissimilar perhaps from those that in the same years Riccardo da Carpi was executing in the contiguous rooms of the Grand’ Maison.

The cover of the porch of Saint-Etienne-le-Vieux introduces different characters. Realized between the end of the 15th century and the beginning of 16th century (Mancel 1846; CAF 1908, 1: 93–105), the porch, Figures 3, occupies the place of the fourth chapel on the northern flank of the church.

The entire structure is the expression of the *flamboyant* style: from the spire decorated with liernes to the structure of the cover, Figures 4, 5, 6.
Here, in fact, the *arcs-diaphragm* are completely fret-worked: that means that in the place of the parting wall there are some sinuous ribs that connect the arches to the inner surface of the ceiling, Figures 7.

The structural system seems to go back to what had been realized in the first years of the 14th century in...
Italian's "forms" and local masonry in early French Renaissance

Figure 7
Church of Saint-Etienne-le-Vieux in Caen. Detail of the arc-diaphragm

England, in the cathedral of Bristol (1311–1332) and in the monastery of Southwell (1320–1330), where these fret-worked *arc-diaphragm*, also defined «archi volanti» i.e. flying arches (Franchetti Pardo, [1997] 2001, 384) appear. In the church of Bristol, «the vault thrusts are brought down and equalized by a singular system of cross arches in the side aisles, supporting curious double vaults set sideways» (Harvey, [1950] 1974, 165).

In the Berkeley Chapel of the same church, only the ribs of the rib-groined vault remain, completely deprived of any groin, parting walls or fret-works. As observed by Franchetti, in this kind of vault the static component is used «come pretesto per attingere a risultati di ordine essenzialmente figurativo [ . . . ] forme derivate da elementi del lessico statico vengono spesso impiegate in contesti del tutto esterni al tema della staticità» ([1997] 2001, 384).

It is not evident whether the cover of Saint-Etienne derives from autonomous French research into the extreme development of the gothic culture or can in some way be connected to the English experiences, as hinted by Viollet-le-Duc ([1854–1868] 1997, 4: 122). In my opinion, the Anglo-Saxon domination in Normandy during the Hundred Years War (1417–1450) does not explain the migration of this constructive technique, not very diffused even in England. In fact, it is very difficult to imagine the English deliberately exporting this type of vaults, above all in light of the policy inaugurated by Henry V (treaty of Troyes of 1420) and continued by the duke of Bedford of presenting the king of England not as a conqueror but as a legitimate descendant of the French king Charles VI. Therefore there was no political advantage in imposing an English constructive tradition in France.

The expansion of the constructive system of the voûtes plates dallées in Normandy (1516–1552)

The covers of the lower chapel of GailJon and of the porch of Saint-Etienne utilize the same static system, even if they reach different formal results. From these two structures, classifiable respectively as «full arc-diaphragm» and «fret-worked arc-diaphragm», originates the greater part of the other *voûtes plates dallées* covers that were built in Normandy until 1560.

Full arc-diaphragm

In the chapel of the bishop’s palace in Bayeux, commissioned by the Veronese Ludovico di Canossa between 1516 and 1531, the system of GailJon is applied to an octagonal plan. The chapel is directly accessible from the new gallery which starts from the bishop’s apartment, in conformity with a model that will become current in the distribution of the French dwellings of the first half of the 16th century (CAF 1908, 1: 174; Chatenet, 2001). The full *arc-diaphragm* are disposed in four couple of parallel arches that join the vertex of the octagon, Figures 8.

The frescoes have been added in the 17th century. The diagonally-traced ribs indicate that this building still belongs to the late gothic tradition. But, as pointed out by Chatenet (2001, 388), the fact that this type of structure is used in one of the first Renaissance castles of France, GailJon, and in the residence of a sophisticated Italian humanist such as Ludovico di Canossa, determines the immediate success of the model, which is at once considered a Renaissance innovation.
The coat of arms of the cardinal Jean the Veneur are represented in the chapel, therefore he could be the patron of this part of the church (Mouton, 1926, 23). In the chorus, datable to 1546, there are some fret-worked *arcs-diaphragm*. The structure-bearing ribs and formerets of both rooms still follow the gothic constructive logic, but the decoration is by now totally Renaissance: the gothic drawing of the ribs has been transformed in buttress of pier decorated with candelabre; the stone flags of the ceiling and the classic bas-reliefs adorning the parting walls employ forms derived from the repertoire of classical antiquity; in the chorus the fret-working is obtained using a small series of full-centre arches, built over some little Corinthian square ashlar piers.

A series of large full *arcs-diaphragm*, disposed on parallel, characterizes the cover of the porch of Notre-Dame at Vétheuil, in the Normand Vexin. Figures 10.

The porch, showing the coat of arms of Louis de Silly and Anne de Montmorency-Laval, is dated by Pérouse de Montclos to 1540–47 (Regnier 1909–1910; Pérouse de Montclos 1992, 715–717). The segmented arches are built over pilasters, which articulate the two sidewalls alternating themselves with full-centre arches niches. The stone flags of the ceiling are decorated with regulars forms that imitate coffers and ceiling reeds.
Fret-worked arcs-diaphragm

The prototype of Saint-Etienne-le-Vieux is first repeated in the radial chapels of the ambulatory of Saint-Pierre in Caen, constructed between 1518 and 1545 (CAF 1908, 73–75). Here, the theme of the fret-worked arc-diaphragm is developed exalting the structural and decorative aspects. Every chapel has a different structure of liernes organization, which spaces from the rib-groined vault to the tracery vaults with *retonné central* or with a crown rib. The bearing ribs, conceived as «archi volanti», are always connected by secondary decorated ribs. Over the bearing structure the carved stone flags fill up the spaces between the complex game of the branches. All the structure is really articulate, and it is very difficult to recognize the role of the bearing arches, leading to the structural ambiguity so strongly disapproved by John Ruskin three centuries later.

An analogous situation is found in three of the ambulatory chapels of Saint-Jacques in Dieppe, built between 1525 and 1543 (Legris, 1918; CAF 1926, 251–279; Cahingt, 1983). Originally, also the Virgin's chapel, situated on the longitudinal axis of the chorus and destroyed by the English bombardments of 1694, had a *voûtes-plates dallées* cover, as we can see in the description of David Asseline of 1682 (italics added):

*Voûte faite de pierre, très délicatement façonnée, aussi plate qu'un plancher; retenant néanmoins six culs de lampe très gros et très longs, chacun desquels est chargé de quatre images de hauteur d'homme* (Legris, 1918, 96).

The vaults of the Virgin's chapel have been reconstructed in the 18th century with normal rib-groined vaults and, currently, the *voûtes-plates dallées* cover only the chapels of Saint-Nicolas (ex Saint-Michel), Figures 11, Saint-Yves (ex Saint-Jérôme) and Notre-Dame des Sept Douleurs. They were all constructed between 1525 and 1550, commissioned respectively by the shipowning families Guilbert, Ango and Saint-Maurice. In this instance the attention of the constructors focuses on the complex multiplication of the ribbings and not on the decoration of the stone flags.

A cover of the same type characterizes the Virgin's chapel of the abbey of Valmont, commissioned by Jean Ribault, Abbot from 1517 to 1552 (CAF 1926, 387–404; Mere 1979, 7–8). Human figures, foliage, shells and scroll ornaments decorate the ceiling of the chapel.

An opposite result, focused on the research of the stone coffered ceiling, is found in the splendid covers of the radial chapels of Notre-Dame-des-Marais at La Ferté Bernard, in the department of the Sarthe, Figure 12.

In this case the geographic location appears eccentric, as the Sarthe is outside Normandy, but the presence of the *voûtes plates dallées* in this zone is easily explained by taking into account the larger area occupied by the region in ancient times. The construction of the three chapels, by the *maîtres-maçons* Jérôme Gouin and Jean Texier, began around 1524 but the covers have been realized just in 1543–44 by other hands, since Gouin and Texier died respectively in 1526 and 1531. The structure and the mature Renaissance decoration are due, most probably, to Mathurin Delaborde, in charge of the
columns distribute uniformly the weight of the ceiling on the bearing ribbings. From the main arches to the crown rib other filigrees complicate the structural game. Exquisite and varied carvings of the stone ceilings add to the technical-formal complexity of the ribbings. In this building a perfect imitation of the wood coffered ceilings is achieved. In the chapel of the Sacré-Coeur the frame designs octagons and small rumbles, decorated with vegetable forms and human faces. In the first two spans of the axis chapel Greek crosses and squares form a regular sculpted texture, while in the apsidal part the carved coffers assume a round shape. In the Saint-Joseph chapel, finally, where the geometric design of the ceiling still follows the trapezoidal plan determined by the bearing ribbings, the game of regular geometric shapes is obtained by the chromatic alternation of black and white. Figures 13.

The Examples examined up to now follow the prototypes of Gaiillon and Saint-Etienne-le-Vieux, without introducing substantial modifications to the static conception of the structures. A remarkable step

Building yard from 1535 (CAF 1961, 225). Both the axis chapel, dedicated to the Très Saint Sacrement, and the two lateral ones, dedicated to the Sacré Coeur on the left and to Saint-Joseph on the right, open on the ambulatory with a clean span of 6.35 meters. The pointed arched with crown ribbing and retombé central and the fret-worked arcs-diaphragm are conceived with a clearer logic of the structure than the examples of Caen and Dieppe.

In fact, the juncture between the stone ceiling and the ribs is assured by a series of small arches built over column or by some architraved columns, very similar to those of Saint-Hilaire in Tillières. These
forward is done in the realization of the chapel commissioned by the canon Jean Baptiste Bouton in the collegiate church of Notre-Dame in Beaune, in Burgundy, built between 1529 and 1533 by the maçons Jean and François Lejay (CAF1928, 290–302). The cover of the chapel perfectly reproduces a stone coffered ceiling, without showing any elements of support. It seems to be resting only on the Renaissance consoles that run all over the perimeter of the room, Figures 14. But the static characteristics of the stone and the dimensions of chapel (600 × 495 cm.) naturally leads to exclude such solution and indicates (suggests) instead a system of flat arch straight vaults (Pérouse de Montclos, 2001, 163).

But the stone ceiling of the Bouton chapel is not a straight vault. Here the constructive technique of the voûtes-plates dallées cover is used in order to realize a perfect imitation of the wood coffered ceilings, the formal model of which is traceable, most probably, to the coffered ceiling of the palace of Justice in Dijon, commissioned by the king Francis I in 1522. This ceiling covers a 17 × 12 meters room and is composed of 35 regular coffers, decorated with ceiling reeds. We can distinguish it from contemporary French examples for the absence of gothic ribbings and for the full Renaissance decoration.

The more interesting aspect of this cover, however, is not the perfect imitation of the wood ceilings, but its structural conception: the idea of using the rib-groined vault as a support for the ceiling of the voûtes plates dallées, is reinterpreted by transferring the bearing structure beyond the extrados of the cover. Above the ceiling, the branches of a rib-groined vault, completed by tie inverted arches, are completely hidden from the observer’s view. The stone flags are suspended from a series of tie beams. The anchor bolts are concealed in the Renaissance ceiling reeds. The outward appearance of the building is adapted to its the interior structure: a fine carved gallery hides the view of the complex structure, Figures 15.

In practice, the system of the voûtes-plates dallées cover elaborated in Normandy has been freed from its gothic elements in order to realize an innovative, totally Renaissance, stone coffered ceiling.
The transfer of the Norman system to Burgundy is due, most likely, to the patron, who was familiar with Norman architecture, in particular with the buildings of the d'Amboise family. In fact in 1512, Jean Baptiste Bouton, who already held several appointments in the Burgundy diocese, became in 1524 general vicar of Georges II d' Amboise, archbishop of Rouen. In this capacity he certainly visited the chapel of Gaillon and, most probably, the other Norman buildings which employed the vouûtes-plates dallées cover.

In my opinion, the development of a full Renaissance style can be attributed, at least in part, to the particular cultural atmosphere that prevailed in Burgundy, in particular the region of the Côte d' Or, in the 1530's. In fact, from 1529 is present in Dijon Claude de Longvy de Givry, bishop of Langres, descendant from one of the noblest families of the region, named cardinal in 1533, fine diplomat and deep connoisseur of Italian art. As early as 1510 his artistic and literary interests are pointed out in the dedicatory epistle of the Metamorphoses of Pierre de la Vigne. Similarly in 1520 Jean Fustaillier dedicates to Givry his De urbe et antiquitatibus Matthiasconensibus. Moreover there is a possibility that the artists, who worked in the Bouton chapel, are the same who made the new Renaissance decoration of the chapel of the castle of Pagny, commissioned by the cardinal between 1535 and 1538 (CAF 1929, 305–316; David, 1929).

**CONCLUSIONS**

The fortune of the vouûtes-plates dallées in France and in Normandy ended around the middle of the 16th century, excluding the isolated case of the cover of the aisles and the ambulatory of Saint-Germain d'Argentan, realized between 1600 and 1610 by Jacques Gabriel, who also worked in Saint-Pierre in Caen in 1603. The development of stone-cutting techniques and the experiments of Philibert Delorme led French architecture to other accomplishments. In similar fashion the solution adopted in the Bouton chapel does not seem to have been followed neither in the region neither elsewhere in France. In both cases these structures are hybrids developed in that delicate period of transition between flamboyant and the Renaissance and characterized by formal inventiveness and structural audacity. They also testify the will and the ability of the French craftsmen to absorb and adapt new stylistic features to their technical base: they imitated the transalpine shapes but also invented new solutions, integrating two different static systems and finally arriving to the spectacular artifice of the Bouton chapel: «en s'affranchissant de la routine dans laquelle se tenaient les maîtres du XVe siècle, ils appliquèrent aux formes nouvelles les ressources de l'art de la construction du moyen âge» (Viollet-le-Duc, [1854–1868] 1997, 4: 124).

**NOTES**

1. The first had been seen by the French army in palazzo Venezia in Rome during the campaign of 1494–1495 and the second was introduced by Riccardo da Carpi in the castle of Gaillon in the first years of the 16th century.
2. For example, the vaults of the Saint-Thomas' chapel in the collegiate church of Nantes, of the collegiate church of Saint-Jean at Montrésor, of the churches of Sepmes and Villiers-au-Bouin. The eastern gallery of the cloister of Saint-Martin in Tours is covered by a series of hanging domes, where the ribs form the regular compartment.
3. For example, the vaults of the court's gallery of the castle of La Rochefoucauld but also the covers of the chapels Poitiers, Cytois and Fresneau in Notre-Dame la Grande in Poitiers.
4. I am grateful to Pascal Leroux, who guided me among the ruins of the church, sharing with me his unpublished studies on the building. Thanks to Yves Lescroart I have been able to visit the parts of castle of Gaillon normally closed to the public.
5. The night of July 22th 1694, Lord Berkeley, commander of the British fleet, ordered the bombardment of the city.
6. The carved hanging keys, for example, are derived directly from those in the palace of Justice of Rouen, thus confirming the influence of Norman architecture in the neighbouring regions.
7. The king of France held in Dijon a «lit de justice» in 1521 and would have donated to the city the ceiling the following year (Fetu, 1872, 43–45; CAF 1928, 305).
8. Georges I d' Amboise became archbishop of Rouen three years after the death of his uncle Georges 1st d' Amboise (1510), the client of the castle of Gaillon.
9. P. Ovidii Nasone Metamorphoses libri moralizati : cum pulcherrimis fabularum principaliwm figuris Ovidii quindecim Metamorphoseos libri . . . par reverendum
patrem magistram Petrum Lavinium philosophum poetam ac theologum... Anno Domini millesimo quingentesimo decimo XV kal. mai.

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