An 18th Century Manual on Architecture: Fray Juan Albarrán's *Barias Reglas de Arquitectura*, 1735 (Part Two)

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Abstract: The building of the Santo Niño church is a benchmark event for the study of Philippine architectural history. Apart from the happy fact that this building still stands, are two narratives written by its builder, Fray Juan Albarrán. This Augustinian was assigned as prior to the Cebu convent for two terms, 1735-1737, and 1737-1740. During this time, he planned, oversaw, and completed the rebuilding of the Santo Niño church. His narratives, "Advertencias para obras que se puedan ofrecer en este Convento" (Words of advice for projects that can be offered in this convento") and "Barias Reglas de Arquitectura" (Various Rules for Architecture) were written between 1735 and the first half of 1736. These texts, which document Albarrán's experiences in the very early building stages of the church, are perhaps the earliest materials we have to a manual for construction in Spanish colonial Philippines.

Keywords: architecture manuals, Augustinians, Cebu, Juan Albarrán, Santo Niño Basilica

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Introduction

Serendipitously, just after turning in the manuscript of the first part of this article to the *Philippiniana Sacra* office, more materials on Fray Juan Albarrán and the Santo Niño church turned up. We include the more pertinent details in this, the second part. Additionally, while working on another project in the library of San Pablo monastery in Intramuros (more popularly known as San Agustín), two books bearing the signature of Fray Albarrán appeared. These were the third and fourth volumes of the Jesuit St. Robert Bellarmine's *Disputationum ... de Controversiis Christianae Fidei*, (Venice, 1599). In his handwriting, Fray Albarrán consigned these books to the library of the convento of the Santo Niño in Cebu;[3] they were probably brought back to Manila sometime in the past century. Albarran's signature and handwriting on these tomes are identical to his entries in the *Libro y Inventario* prepared in 1735 for the convento in Cebu. By the same token, they confirm that a clerk inscribed the rest of Albarran's prepared text in that volume for the *Advertencias* and *Barias Reglas de Arquitectura* featured in the present work, which would explain the inconsistencies in Spanish spelling and grammar. This second and last part pertains to folios 84 to 88v of Fray Albarrán's *Barias Reglas*.[4]

A closer reading of four early maps of Cebu helps us visualize the context of the Augustinian enclave (that of the Santo Niño) in that port city.[5] The first is a copy of one formerly in the Jesuit College in Cebu, dated 1699.[6] The second is a copy of this first one, commissioned in 1735 by the Augustinians in the Santo Niño convent.[7] Curiously, if optimistically, it depicts how the Santo Niño church would have looked like when completed: construction had just begun in February that year. The third is a copy of an undated old map, bound together with the second one.[8] Lastly, the

[3] In 1735, Fray Albarrán noted that the Cebu library had 426 volumes. [Gregorio Santiago Vela, O.S.A.], "Convento del Santo Niño de Cebú (Datos para su historia- Conclusión)," *Archivo Histórico Hispano-Agustiniano* 6 (1916b): 178.

[4] Juan Albarrán, O.S.A. 1735. "Fabrica de la Yglesia Año de 1735," "Advertencias para obras que se puedan ofrecer en este Convento," and "Barias Reglas de Arquitectura." In "Convento de Cebu: Registro-inventario. Rudimentos de edificación, 1735-1883." Archivo de la Provincia de los Agustinos Filipinos, Valladolid: 316/1.

[5] The four maps have been recently reproduced in Roberto Blanco Andrés, "El convento del Santo Niño de Cebú: Datos para su historia al inventario de 1735," *Archivo Agustiniano* 106 (2022): 29-104. This excellent article also gives a detailed account of the development of the Santo Niño church from its beginnings until its completion by Fray Juan Albarrán.

[6] Resil B. Mojares, *Casa Gorordo in Cebu. Urban Residence in a Philippine Province 1860-1920* (Cebu: Ramon Aboitiz Foundation, Inc., 1983), between pp.18-19. The one reproduced here is a copy of the one sent to the Archivo Histórico Nacional in Madrid.

[7] Juan Albarrán, O.S.A., "Convento de Cebu: Registro-inventario. Rudimentos de edificación, 1735," fols. 23v-24. Archivo de la Provincia de los Agustinos Filipinos, Valladolid; 316/1.

[8] Ibid., fols. 22v-23.

fourth is the one in Fernando Valdés Tamón's 1738 report;[9] despite its date, this map depicts the Santo Niño church before its major rebuilding in 1735. The city was laid along a grid composed of equal-sized blocks; each block was in turn divided into four equal parcels. From these maps we observe that the biggest landowners were the Augustinians (whose compound comprised four whole blocks) and the Jesuits (two blocks). These church compounds dominated the city's shores, as if they were the city's marine frontliners: those of the Augustinians and Augustinian Recollects on the southwest, and that of the Jesuits on the northeast.

According to the first (1699) map, a church for the Santo Niño and its convento were already standing on the site of the present structures (the western half of today's compound). On the same map, however, a *convento antiguo* was indicated on the eastern half, today's church plaza. It seems that the church that adjoined the *convento antiguo* may have deteriorated so much that it and a new house were built on the western side, as they appear in the 1699 map. These in turn may have been so badly built that a new church for the Santo Niño was begun in 1731 on the lot occupied by the church that adjoined the *convento antiguo*. According to Valdés Tamón 1738 map, this 1730s edifice faced north, like the nearby cathedral. The Augustinians' request for *reservas*, laborers who by working on the project would be exempted from the regular *polo y servicio*, was granted in 1731 by Governor Valdés Tamón for four years.[10]

In 1733, it was observed that the bricks used for the building were quickly deteriorating, and the project was abandoned. In 1734, orders for another construction were given. The task was assigned to the newly arrived prior, Fray Juan Albarrán, who laid the foundations for the new church on 14 February 1735. This, the present church, faces east (also like the new cathedral), and stands on the block immediately across the previous church (the one that adjoined the *convento antiguo*). The adjoining convento, as we shall see below, was completed a few decades later.

[9] Fernando Valdés Tamón, *Report in which, by Order of his Catholic Majesty (may God protect him), the Strongholds, Castles, Forts and Garrisons of the Provinces under his Royal Dominion in the Philippine Islands are Listed*, Prologue and transcription by Mariano Cuesta and Violeta Infante; translated by Susan Meredith, Catherine Lawrence and Jennifer McDonald ([Santander:] Santander Investment, S.A. 1995 [1738-1742]. [Translation of Biblioteca Nacional Ms. 19217]), 126-127.

[10] Manuel Díez Aguado, O.S.A., "El verdadero pilar de Filipinas [Capítulo IX]," *Archivo Histórico Hispano-Agustiniano* 18 (1922): 177-180. See also Isacio Rodríguez Rodríguez, O.S.A., [Notes to] "[Decreto del Capitán General de Filipinas, D. Fernando Valdés Tamón, en favor del templo del Santo Niño de Cebú.] Manila: 17 abril de 1731," *Historia de la Provincia Agustiniana del Smo. Nombre de Jesús de Filipinas*, II (Manila, 1966): 422-426. The request for *reservas* was granted again in 1735 by the same governor. Manuel Díez Aguado, O.S.A., "El verdadero pilar de Filipinas [Capítulo X]," *Archivo Histórico Hispano-Agustiniano* 19 (1923): 59.

Fray Albarrán was a minister among the Tagalog pueblos, where he is credited with the building of the church in Hagonoy (1731-1734). This is his only known construction experience before his work in Cebu; it would certainly make an interesting study to compare Hagonoy and Santo Niño in Cebu for any building similarities. In his first months in Cebu, Albarrán prepared a thick inventory of properties of his order's convent in the province. As he gained experience in building Santo Niño, he followed the inventory with his "Advertencias para obras que se puedan ofrecer en este Convento" (Words of advice for projects that can be offered in this convento") and "Barias Reglas de Arquitectura" (Various Rules for Architecture). Although the next entry after the "Advertencias" and "Reglas" is a visitation note dated May 1736 (which could imply that Albarrán was a man in a hurry, just barely a year after the start of construction), the actual dating of these two narratives cannot be ascertained. A few folios before these texts are documents dated 1737 and 1739.

By 1737, when Albarrán was elected for another 3-year term in Cebu, the walls had reached the the windows.[11] On 16 January 1740, Fray Albarrán and the Augustinian Provincial, Fray Vicente Ibarra, enthroned the Santo Niño in the central retablo.[12] Finally, on 2 March 1740 Fray Albarran, before he left for Batangas, entrusted his *obra maestra* to his successor, Fray Antonio López.[13] We select some details from the description of the newly concluded church, as recorded on that day in the book of income and expenses of the convento of Cebu.

The façade was carved with images of Augustinian saints, seraphim, the Santo Niño, and the arms of the Order. All the doors were of *tíndalo* and *molave*; the larger ones were carved. The postern doors of the main entrance were carved with the images of Saint Peter and Saint Paul. All the windows, except those of the choir, had panes of *capiz* shells. The choir loft, which rested on *llavetas* and *soleras*, was supported by two pillars over four carved statues, all of stone. The pulpit with its steps was of ebony and *tíndalo*. At the crossing of the nave and transept were four large arches of stone (*arcos torales*). Five old retablos were installed over stone bases; they were provided with many pieces that were lacking. On the second level of the central retablo was the throne that supported the carved, painted, and gilded tabernacle that enshrined the Santo Niño. The rear of the tabernacle opened onto another, smaller, retablo, located in the chapel over the sacristy. The alcoves (*bóvedas*) over the presbitery, transept, and the beginning of the nave from the crossing, were all of molave panels. All the woodwork of the roof had been completed, including the

[11] Díez Aguado, "El verdadero pilar de Filipinas [Capítulo X]," (1923): 60.

[12] [Gregorio de Santiago Vela, O.S.A.], "Convento del Santo Niño de Cebú (Datos para su historia) (1)," *Archivo Histórico Hispano-Agustiniano* 6 (1916a): 34.

[13] Díez Aguado, "El verdadero pilar de Filipinas [Capítulo X]," (1923): 60.

llaves, *quilazon*, and *boncalos*, which were carved with angels; the roof was covered with tiles. The hexagonal bell tower was of three levels; the first level carried bas reliefs in stone of Augustinian saints.

As noted above, one of Fray Albarrán's maps was copied in 1735 from one made in 1699, which was being kept in the Jesuit church in Cebu.[14] Perpendicularly across the Santo Niño church, on what is now the plaza for the fiesta celebrations, appears the impressive quadrangular, two-level *convento antiguo* (or it could have been an "artist's rendering" of a projected convento to replace it). The empty lot next to it was the site of the brick church that was abandoned in 1734. In 1743 Fray Albarrán, this time as visitator, recommended that this brick ruin be demolished. Although an order was made in 1745 for its relocation to the left side of the newly built church, the foundations of what would be the present monastery were only dug in 1751.[15]

A small shrine (*ommilladero*) was also erected during Fray Albarran's tenure, to the south of the Augustinian compound. It stood on the site believed to be where a mass was celebrated by Fray Andrés Urdaneta. Historians are not sure if the cross in the shrine is that left by Magellan in 1521, or the cross of stout bamboo that the Augustinians erected in front of their chapel, which averted a fire in 1566. This chapel was replaced in 1834, this time with metal grills to prevent the locals from shaving off slivers for their devotions.[16]

On this English translation

Spanish terms for measurements will be retained in this translation; it did not seem euphonic to use 'yards' or 'fathoms.' Since some architectural terms are too technical and not familiar with most readers, it was decided to retain some local and Spanish architectural terms, especially those pertaining to the roof, in this translation as well. Additionally, we are not exactly sure about the accuracy of translating the local and Spanish terms themselves. There seem to be at least three kinds of *cintas* (purlins). The contexts of the terms will need further study: the locale and its culture groups, the time frame, and the degree to which some terms were generic or specific, for example. The presence of some Cebuano words (*dagan*) is expected; but the presence of some Tagalog words (*bongcalo*, *cahaban*) may also imply that Fray Albarran brought with him some Tagalog carpenters. Some words such as *quilo* and

[14] Albarrán 1735: fols. 23v-24.

[15] Santiago Vela, "Convento del Santo Niño de Cebú. Datos para su historia (1)" (1916a): 34-35.

[16] Manuel Díez-Aguado, O.S.A., "El verdadero pilar de Filipinas [Capitulo V]," *Archivo Histórico Hispano-Agustiniano* 17 (1922a): 7-8.

barateja are what Zialcita considers Filipinismos, not found in Spanish dictionaries then or since.[17]

The first time a term is used in the translation, it is introduced in bold type, and the definition is footnoted. Sometimes, the English equivalent will also follow in brackets. More detailed definitions with their sources will be in the Glossary at the end of this article. PS

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[17] Zialcita, Fernando, and Martin I. Tinio, Jr. 1980. *Philippine Ancestral Houses (1810-1930)*: 243. Quezon City: GCF Books.

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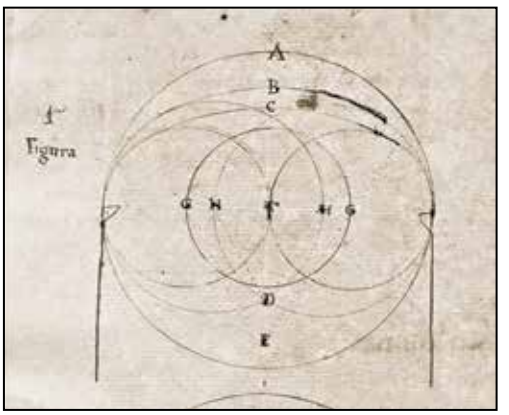
Arcos

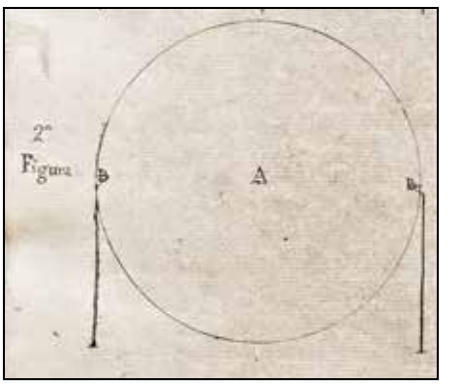
No es menos excencial en una fabrica el saber formar una [sic] Arco que lo rrestante de las reglas proporcionadas a ella; Por lo que, por la figura siguiente se podrá formar qualquiera [sic] arco de los tres que más comúnmente practican los arquitectos [fol. 84v] y en ella se manifiesta el arco de medio punto, Dos círculos, o carpanelo[1] mayor, y de tres círculos, o carpanelo rebajado. El prim*e*ro que es el de m*edi*o punto, se manifiesta en la primera figura en la letra A, y su centro es la letra F. El segundo que es de dos círculos se demuestra con la letra B, y sus centros son HH y D. El tercero es de tres círculos se demuestra con la letra C, y sus centros con las letras GG y E. Pero para mas claridad pondré en figura distinta cada uno de estos tres géneros de arcos.



1.ª Figura

2.ª Figura.

Esta segunda figura demuestra el arco de un círculo, o medio punto, formase tomando el anchor[2] que tubiese el lugar en donde se hubiese de hacer el arco. Yg., tiene de ancho quatro baras, suvirá el arco dos, como se demuestra en esta figura, fixando el un pie del compás en el A, y el otro en la letra B, y bolbiéndole hasta la otra B, y así queda perfecto este arco.



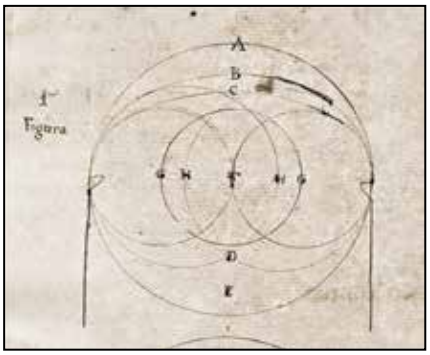
2.ª Figura

[1] *Carpanelo*: currenty spelled *carpanel*.
[2] Archaic spelling of *anchura*.

Arches

In a construction it is no less essential to know how to form an [sic] arch, than the rest of the rules provided for it. So, through the following figure, it is possible to form any of the three arches most commonly practiced by architects. [fol. 84v] Shown here are an ***arco de medio punto***[1] [round arch], an arch of two circles or an ***arco de carpanelo mayor***[2] [higher basket-handle arch] and an arch of three circles or an ***arco de carpanelo rebajado***[3] [lowered basket-handle arch]. The first, which is the round (arch), is shown by the letter A in the first figure and its center is the letter F. The second which is of two circles is shown by the letter B, and its centers are HH and D. The third which is of three circles is shown by the letter C, and its centers with the letters GG and E. But for the sake of clarity, I will put each of these three types of arches in a distinct figure.

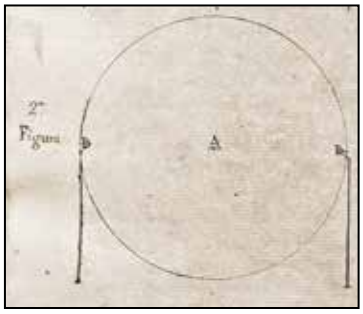
Fig. 1



2nd Figure

This second figure shows the arc of a circle, or a semicircle which is formed by taking the width of the place where the arch is to be made. This arch is four ***baras***[4] [yards] wide with the arch rising two *baras* and, as shown in this figure, by fixing one point of the compass in A and the other in letter B, and turning it back to the other B, you will have this perfect arch.

Fig. 2



[1] Half-circle arch, also called semicircular arch or *arco romano* (Roman arch). The rise of this arch is equivalent to half of the span.

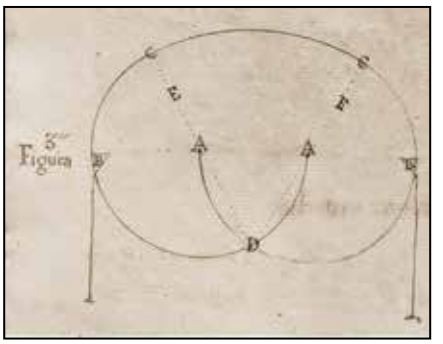
[2] Higher basket-handle arch.

[3] Lesser or lowered basket-handle arch.

[4] *Baras* or *varas;* Three piés (feet), or 84 cm. A *vara* is equivalent to a yard.

3.ª Figura.

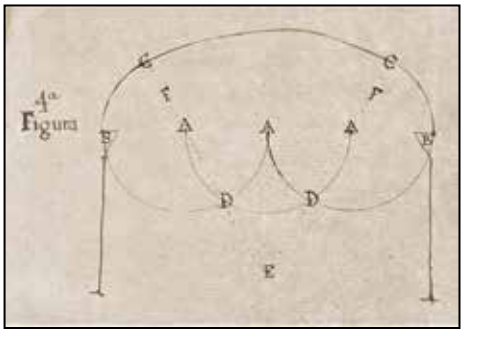
Demuestra esta 3.ª figura el arco de dos círculos, o carpanelo maior. Formase dividiendo en tres partes el ámbito que tubiese el arco como se ve en las letras AA y dividido dichas letras son el centro de los círculos, los quales dados se devide cada uno en seis partes y tomada la una que en esta figura es desde B a C se fixará el un pie del compás en el punto A y el otro en B, y se dará una línea hasta la C. Después se verá donde cruzan los dos círculos que es en la letra D, y puesto en ella el un pie del compás el otro se abrirá hasta la letra C, y se bolberá hasta la otra C. Las letras EE son los rayos del carpanelo mayor.



3.ª Figura

[fol. 85] 4.ª Figura.

En esta figura se mira el arco de tres círculos, o carpanelo menor, o rrebajado que llaman. Formase dividiendo en qua*rt*as partes el ámbito que tubiese en donde se hubiese de formar y se demuestra en esta figura con las letras AAA y puesto en ellas el unpie del cumpás se da un circulo en cada una de ellas: Devidase después el un circulo en seis p*ar*tes y tomada la una que aquí es desde B a C se fixará el unpie del cumpás en la letra A inmediata a la B, y el otro pie del cumpás se pondrá en la B y se dará la línea asta la letra C por una y otra parte. Después se verá en donde cruzan los círculos que es en la letra D y desde ella se tomará perpendicularm*en*te lo mis*m*o que ai desde A a C y se señalará por la parte de abajo como se vee en la E y en ella se fixará el unpie del compás, y el otro en la letra C y se dará la línia hasta la otra C y así queda perfectamente formado el Arco de tres círculos. La FF es el rayo mayor del carpanelo menor rebajado.



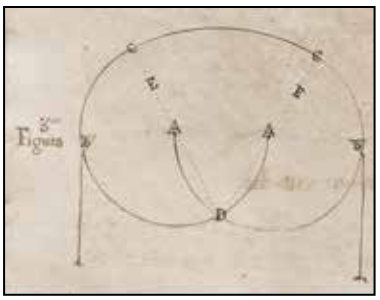
4.ª Figura

3rd Figure[5]

This third figure shows the arch of two circles or *arco de carpanelo mayor* [higher basket-handle arch]. The arch is formed by dividing the span of the arch into three parts as shown in the letters AA, and these letters divided are the centers of the circles, each of which is divided into six parts and taking the one that in this figure is from B to C, one leg of the compass will be fixed at point A and the other at B, and a line will be drawn to C. Then you will see where the two circles intersect, which is at the letter D, and when you place one leg of the compass on it, the other will open up to the letter C, and then you will turn to the other C.

The letters EE are the rays of the major basket-handle [arch].

Fig. 3



[fol. 85] 4th Figure

In this figure we can see the arch of three circles or *arco de carpanelo menor* [lesser or lowered basket-handle arch]. The arch is formed by dividing the span in four parts where it is to be formed, and this is shown in the figure with the letters AAA. With a leg of the compass set on these letters, draw a circle around each. The circle shall then be divided into six parts and with the first part, which here is from B to C, set a leg of the compass at the letter A next to B and the other leg of the compass in letter B, and draw a line until the letter C in both sides. You will then see where the circles intersect, which is at the letter D, and from there take perpendicularly the same as from A to C, and mark the lower part as you can see in E, and here, set a leg of the compass and the other in letter C, and draw a line until the other C and you will have perfectly formed the arch of three circles. The FF is the major ray of the lowered lesser basket-handle arch.

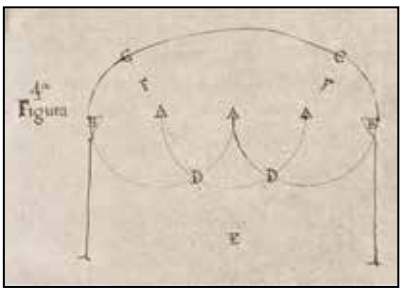


Fig. 4

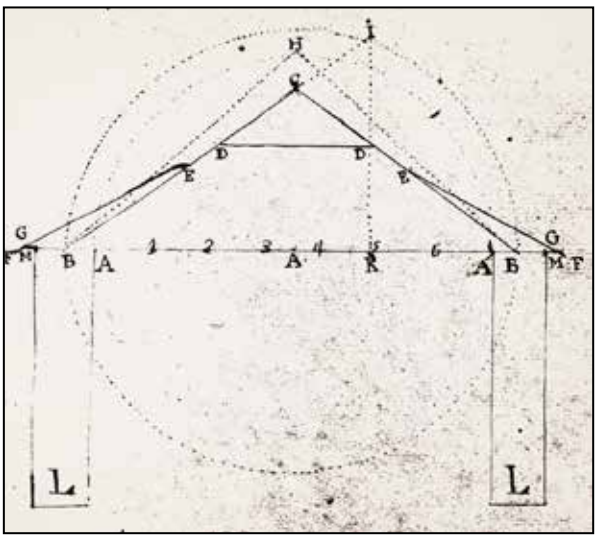
[5] This arch is formed from two identical circles overlapping through the center of the other.

Columnas[3]

En la frente del edificio deben ser las columnas en numero pares, para que cayga en me*di*o el intercolumnio en que ha de estar la puerta y entrada, que por esto debe ser mayor que los demás intercolumnios, y por esto también, esto es porque mejor paresca y se vea la puerta se debe poner en el me*di*o y esto baste en quanto a columnaciones simples. Pero si se hazen atrios ambolatorios o pórticos con pilastras, se han de disponer estas de manera que estas no sean menos gruesas que el 1/3 del espacio intermedio, o del vacío entre una y otra pilastra, y a las que se hizieren en los ángulos de la fabrica tenga la solides y firmeza devida mas quando han de sustentar muchísima carga y peso entonces tendrán de grueso la mitad del vacío o sus dos tercios. Pero en las fábricas y edificios particulares no tendrán menos de un tercio ni más de dos: y debieran las tales pilastras ser quadradas, para ahorrar de gastos, y dexar mas lugar p*ar*a el paso serán menos gruesos por los lados que por la frente para aumentar también el ornato de la fabrica pónganse en medio de la frente de estas pilastras unas medias columnas o pilastras menores que lebanten o mantengan la corniza que ha de estar sobre los arcos de los pórticos y las dichas medias columnas tendrán el grueso según su altura, y según el orden a que pertenecen.

Modo de formar un techo

Supongo que una obra tiene de ancho el su bacío siete **brazas** y de centro a centro de las paredes tiene ocho brazas. Esto supuesto: Digo que los quilos deven tener de largo [fol. 85v] cinco partes de esas ocho, esto es cinco brazas de las ocho d*i*chas. Esta proporción y/ medida nace de una regla que el Arte llama Cartabón de cinco, y se funda dicha regla en cierta operación arquitectónica que repetida cinco veces a la redonda de un círculo lo mide pontualíssimamente sin faltar ni sobrar nada. Y sirbe esta regla de techar para tierras donde ay temblores, y donde se dispara artellería. La ventaja que hace esta medida a la usada en Manila por sus oficiales, y en todas las islas, se vee, y conoce mejor en la figura sigu*ien*te.



5.ª Figura

[3] This entry on Columns could have been derived from Chapter 13 of Andrea Palladio's *I quattro libri dell'architettura* (Venice, 1570). English translation, *The Architecture of Palladio in Four Books*, by Nicholas Du Bois (London: Giacomo Lione, 1715), 19.)

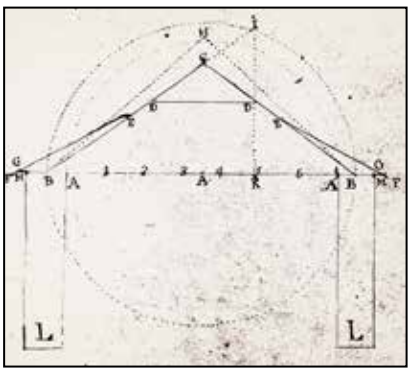
Columns[6]

Columns in front of the building should be in even numbers, so that intercolumniation—where the door and entrance must be located—falls in the middle, which for this reason must be larger than the other intercolumniation, and for this reason too, it is better to put the door in the middle for better appearance and visibility, and this is enough as far as simple columns are concerned. But if ambulatories, atriums or porches are made with pillars, they must be arranged in such a way that their thickness must not be less than 1/3 of the intermediate space or the space between the pillar and another. For those that are made in the corners of the building they must have the necessary solidity and firmness, but when they are to support a lot of load and weight, then they will be half the thickness of the space, or two thirds of it. However, in private works and buildings, they will not have thickness less than one third nor more than two thirds: and such pillars must be square, in order to save cost; and to have more place for the passage, they must be less thick on the sides than on the front. And to also amplify the ornamentations of the building, set at the middle front of these pillars some half columns or smaller pillars that will raise or support the cornice that must be on the arches of the portico, and these half columns must have thickness according to its height and the order[7] it belongs to.

How to form a roof

Suppose that a construction project has a space that is 7 **brazas**[8] [fathoms] wide, and from one midpoint of a wall to its opposite is 8 *brazas*. I say that the length of the ***quilos***[9] [rafters] must be [fol. 85v] 5 parts of these 8 *brazas*, or 5 *brazas* of the said 8 *brazas*. This proportion and measure came from the rule which in Art is called ***Cartabón de cinco***[10] [set-square of five], and this rule is founded on a certain architectural operation which repeated five times within a circle, results in an exact measure without missing or exceeding anything. This rule for roofing serves for lands where there are tremors and where artillery is fired. The advantage of this measure for that used in Manila by its officials and in the entire archipelago can be better seen and learned in the next figure.

Fig. 5



[6] This entry on Columns could have been derived from Chapter 13 of Andrea Palladio's *I quattro libri dell'architettura* (Venice, 1570). English translation, *The Architecture of Palladio in Four Books*, by Nicholas Du Bois (London: Giacomo Lione, 1715): 19.

[7] Refers to the order of columns in classical architecture: Tuscan, Doric, Ionic, Corinthian and Composite.

[8] *Braza*: 2 *varas*, equivalent to one fathom or 1.671810 m.

[9] *Quilo*: principal rafter, truss; synonymous with *tixera*.

[10] *Cartabón de cinco*: Set-square of 5, or fifth square triangle. The *cartabón de cinco* was obtained by joining the extreme points of the space of a framework with those divided into five equal parts the circumference drawn on it as a diameter. See more detailed description in the Glossary.

AAA. Anchura de la obra en supos*ició*n de 7 brazas.
BB. Anchura de centro á centro de las paredes 8 brazas.
BC. Largo de la Tixera en línea, negra 5 brazas; poquito menos; y por esso se dixo arriba nacer próximamente del Cartabón de 5.
DD. Lugar del atravesaño a los dos tercios de la tixera.
EE. Lugar donde salen las sobretixeras, que es la medianía de las tixeras.
FF. Término de las sobretixeras largos dos tercios de las tixeras.
GG. Resalto del can, o bongcalo, y de la cinta, en que descansan las sobretixeras.
BH. Medida Usual de la tierra, que da a las tixeras dos tercias de toda la Anchura: y por esso tan empinada, como se nota.
BIK. Triangulo en que se funda el Cartabón de 5 que aconsejo en esta fig*ur*a aunque no con precisión Matemát*i*ca.
BL. Grueso de las Paredes.
MM. Resalto, o proyectura de las vigas, llaves, o dos palmas fue[fol. 86]ra de la Pared: y esta medida misma es la del Resalto de los Canes o Bongcalos GG.

Suponiendo, que será dificilísimo hallar Molaves derechos, y largos, que abrazan la obra y sus paredes, y sobrepara los resaltos, y firmeza de los tarugos; advierto no ser neces*sari*o absolutamente el tarugo, y menos ser de molabe las vigas; pero sí se hallaren molabes que lleguen al centro de las paredes, será lo mejor y mas seguro, y entonces ademas del can, o bongcalo que se deve poner en las cavezas de las vigas, se pondrán a estos dentro de las mismas paredes otros molabes iguales a los canes en longitud, que con estos formen una cruz, y sirvan de almohada a las vigas, clavadas estas con buenos pernos de fierro apagado en balao, y con el mismo calafateados; y además del perno avrá en d*ic*has almohadas muezcas, que abrazen las cavezas de las vigas. Y con esta traza además de la firmeza que en ello se vee, resulta p*ar*a fuera de las paredes hermosura o por mejor decir, no se vee la fealdad, que traen cavezas de vigas, y tarugos.

Las vigas se compasan regularm*en*te según las pilastras y otras circunstancias que pide la obra pero suponiendo, que las pilastras de centro á centro tienen de me*di*o 4 braz*a*s digo bastar una biga en cada una.

AAA. Width of the work assuming 7 *brazas.*
BB. Width between midpoints of the walls 8 *brazas*.
BC. Length of the ***tixera***[11] [rafter] in black line 5 *brazas*; a little less; and that is why it is aid above that it originates approximately[12] from the *Cartabón de 5*.
DD. Location of the ***atravesaño***[13][collar beam] at two thirds of the *tixeras*.
EE. Location where the ***sobretixeras***[14][rafters placed over other rafters] are set which is in the middle of the tixeras.
FF. End of the *sobretixeras* with lengths of two thirds of the *tixeras*.
GG. Overhang of the ***can***[15][corbel] or *bongcalo*[16] and of the ***cinta***[17] purlin] on which the *sobretixeras* rest.
BH. Usual measure in this country in which the *tixeras* are two thirds the entire width: such that it is too steep, as can be observed.
BIK. The triangle in which the *cartabón de 5* is set as I advise you in this figure, although without mathematical precision.
BL.[18] Thickness of the walls.
MM. Overhang or projection of the ***vigas***[19] or ***llaves***[20] [tie beams] two palms' length[21] [fol. 86] outside the wall: this is the same measure for the overhang of the corbels GG.

Assuming that it is very difficult to find straight and long ***Molaves***[22] that will suffice for the (roofing) work and the walls, and support the overhangs and the strength of ***tarugos***[23] [dowels]; I caution (you) that the *tarugo* is absolutely not necessary, and less so if the *vigas* are molaves; but if molaves can be found that can reach the center of the walls, it will be the best and safest, and in addition to the corbel or *bongcalo* that should be placed at the ends of the *vigas*, these are placed within the same walls with the other molaves of the same length as the corbels; these will form a cross and serve to cushion the *vigas*, and these are nailed with good iron bolts steeped in ***balao*** resin,[24] and with the same caulking; in addition to these bolts there will be notches in these 'cushions' to anchor the ends of the *vigas*. Apart from the rigidity that you see with this outline, is also the beauty in the exterior of the walls; or better said, the ugliness of the ends of the *vigas* and the *tarugos* are not seen.

The *vigas* are regularly set according to the pillars and other circumstances required by the work, assuming however that the pillars have an average distance of 4 *brazas* center to center, I say that one beam is enough in each one.

[11] *Tixera*: Rafter, synonymous with *dagan* and *quilo* used in this text.

[12] There is an apparent contradiction between *puntualísimamente* ('precise') and *proximanente* ('approximate'). Pehaps that is why somebody underlined the latter word in the original manuscript.

[13] *Atravesaño*: Collar beam. This particular collar beam that connected a pair of rafters two-thirds from their lower edges corresponded to the *nudillo* of the *par y nudillo* truss system.

[14] *Sobretixera*: Jack rafter or false rafter; a rafter placed over another rafter. Over-principal.

[15] *Can*: Corbel; synonymous with *bongcalo* in this text.

[16] *Bongcalo*: Tagalog equivalent of the can or corbel.

[17] *Cinta*: also translates to batten or purlin but in this context, it is a tying plate.

[18] If this refers to the thickness of the wall, the most appropriate notation would only be L.

[19] *Viga*: Tie beam, a horizontal beam connecting two rafters; also called *llave* or *tirante*.

[20] *Llave*: Tie beam, also called *tirante* or *viga*.

[21] One *palma* is equivalent to 20.9 cm. In this case, the overhang will be around 42 cm wide.

[22] The *molave* (*Vitex parviflora* Juss.) was the quintessential timber used in pre-Hispanic and Hispanic periods.

[23] *Tarugo*: thick dowel or nail of wood.

[24] *Balao*: A resin obtained from a hardwood.

Los canes o bungcalos hazía dentro de la Yglesia han de sobresalir tanto, quanto entran en la pared: y esto precisamente Porque si entran mas de lo que salen a fuera, será mucho mejor. Pero si salen arriba de 6 palmos, ya es fealdad, y su peso demasiado obra por la puerta contraria contra la caveza de la viga, si queda dentro de la pared.

Es yerro grave quadrar perfectamente algunas maderas de las tendidas en el ayrre, como son vigas, tixeras, sobretixeras, atravesaños de ellas, cintas de sobretixeras (por estar estas casi en ayre) y otras semejantes Y la razón es, por que blandean por los medios de las maderas quadradas, y suspensas en el ayre, y esso menos tienen de firmeza especialmente por temblores fuertes. Por donde tales maderas deven excederse en sus lados, de modo que si una viga Yg. que tiene por un lado de ancho 8 puntos, por el otro tenga mas de 9, *et sic de caeteris*. Las tixeras sean de 5, por un lado, y 6 por otro. Los canes sean como las vigas. Las sobretixeras, como las tixeras, las cintas de unas y de otras, en que ellas descansan por sus pies tengan por lo menos un palmo; y de largo (aunque están las de tixeras sobre pared, y las otras sobre canes) tengan lo largo de centro á centro de los pilares, si ay las 4 brazas arriba dichas: pero esto no quita, y si ay palos mas las largos, se pongan, pues ahorran trabajo y perno de pinturas.

Las tixeras distaran mas de otra con el vacío de 5 palmos; y quando mas solo disten una bara, o 4 palmos. Las cintas sobre puestas a las tixeras, y sobre tixeras deven distar con ygualdad mas de otras entre 6, y ocho palmos, si son fuertes y gruesos; y menos, si fueren delgadas. Ya estas [fol. 86v] distancias se ha de hatender en el aserrar los trosos de baratejas, las quales han de abrazan por lo menos 3 cintas pero resueltamente digo que no disten las dichas cintas entre si arriba de 6 palmos; y serán las barateja gruesas de modo, que duren bien, y no blandeen con el peso de la texa, y la distancia entre cintas.

El grueso de dichas baratexas nunca será menos de medio punto. El palo del cavallete será igual al grueso del quilo, quando menos y cortado de modo, que encaxe, y quadre al ángulo de las cavezas de los quilos, que miran al cielo, porque importa mucho este buen ajuste por la firmeza en temblores, y otros movimientos accidentales: y de largo sean de 4 brazas por arriba quanto se pudiere.

The corbels or *bungcalos* towards the interior of the church must protrude as much as they are inserted into the wall: and this is precisely because if more goes in than comes out, it will be much better. But if they protrude above 6 *palmos*, it is already ugly, and its weight too much work by the opposite door against the head of the beam, if it remains inside the wall.

It is a serious mistake to perfectly square some of the timbers hanging in the air like the *vigas*, *tixeras*, *sobretixeras*, their *atravesaños*, the *cintas* of the *sobretixeras* (for being always in the air) and the likes, and the reason is they are weakened by the means with which timbers are squared and suspended in air, and they have lesser strength especially in strong tremors. Whereby such timbers should exceed on their sides, so that if a *viga* has a side width of 8 ***puntos***,[25] and the other side has more than 9, and so of the rest. The *tixeras* should be of 5, on the one hand, and 6 on the other. The corbels must be like the *vigas*. The *sobretixeras*, like the *tixeras*, and the *cintas* of various parts, on which their bases rest must measure at least one *palmo*; and for their length (although they are those of the *tixeras* on the wall, and the others on the corbels) they must have the length from center to center of the pillars; if there are the 4 *brazas* mentioned above: but this does not exclude, and if there are longer logs, they are set, thereby saving work and painted bolts.

The tixeras will be distant from each other by 5 *palmos*; or 4 *palmos* when they are only no more than a *bara*. The *cintas* on the *tixeras* and *tixeras* must be equally distant from each other between 6 and 8 *palmos* if they are strong and thick, and less if they are thin. These [fol. 86v] distances must be already addressed in the sawing of the logs for the ***baratejas***[26] [tile rafters], and these must be connected to at least 3 *cintas* but I firmly say that these *cintas* must not be more than 6 *palmos* apart; and the *baratejas* shall be thick so that they last well and do not sag due to the weight of the roof tiles and the distances between the *cintas*.

The thickness of these *baratexas* shall never be less than half a *punto*. The wood of the ***cavallete***[27] [ridge beam] shall have the same thickness as the *quilo* [rafter] when cut at the very least in such way, that it fits to the angle of the heads of the *quilos* that point to the sky, because this good fitting is of great importance for the firmness in tremors, and othe accidental movements; and the length shall be 4 *brazas* as far up as possible.

[25] *Punto*: One of 30 equal parts of a *vara*; 1 punto = 2.786 cm.
[26] *Barateja*: A rafter on which roof tiles were aligned.
[27] *Cavallete*: Ridge beam, a structural member used to support the ends of the rafters at the ridge.

Olvidavame decir, que los bongcalos o canes, que sustentan los durmientes, o cintas, en que estrivan las sobretixeras, deven distar entre si tanto quantos que es necessario porque no blande en los sobrepuestos, o con su peso y el de las sobre tixeras y techo: y assí no disten mas de braza ni sean tan gruesos como los otros de las vigas.

Ytt. Si las vigas no fueren de Molabe sean lo sin falta sus canes o bongcalos.

De las maderas

Las maderas según enseña Vitruvio en el Libro 2, Capitulo 9 se deben cortar en el otoño y por todo el tiempo del invierno porque entonces los arboles reciben y recobran de sus raíces aquel vigor y solides, que en la primavera y otoño a vía gastado en flores y frutas cortaranse en la menguante de la luna; porque el humor que pueda causar la corrupción de las maderas, está en este tiempo consumido, por donde no es fácil que les entre la carcoma; debense cortar al principio tan solamente hasta la mitad del corazón, y dexar los assí hasta que se enjuguen y sequen; porque entre tanto se destilara el humor que ocasiona la carcoma, cortadas las maderas se pondrán en lugar donde ni les de el sol, viento, y lluvia, y aquellas principalmente se deben guardar debaxo de techado quede suyo y naturalmente nacen y crecen: para que no se raxen, y para que ygualmente se sequen aprovecha mucho, untarlas con boñiga reciente de vaca; no se arrastren quando la tierra esta húmeda, con el rocío sino después del medio día ni deben labrarse quando están húmedas con el rocío, o quando están demasiadamente secas porque en el primer caso fácilmente se pudren, y en el segundo se labran feamente tres años se requieren para que debidamente se sequen; especialmente para puertas ventanas, retablos y otras maquinas los que quieren edificar, se informaran despacio y preguntaran a los prácticos y peritos de la tierra la naturaleza y propriedad de las maderas y qual convenga a cada cosa y qual no se tal. Lee a Vitruvio, que trata larguísimamente los puntos en el lugar citado.

Sobre el tiempo de cortar, en esta tierra no ay invierno y assí parece que [fol. 87] será el mejor tiempo quando ya los arboles han hechado toda su flor y fruto. Que maderas son aptas aquí para cada cosa?

I forgot to say that the *bongcalos* or corbels that support the ***durmientes***[28] [wall plate] or *cintas*, on which the *sobretixeras* rest, must be as far apart from each other as is necessary to prevent the additional timbers from sagging under their own weight and the weights of the *sobretixeras* and the roof: and so they are no more than a *braza* apart nor as thick as the other *vigas*.

Ytt. If the beams are not of Molave, then their corbels or *bongcalo*s should be so without fail.

Of Timbers[29]

Timbers, as Vitruvius teaches in Book 2, Chapter 9, should be felled in autumn and the whole of winter because thereupon the trees receive and recover from their roots that vigor and solidity, which in spring and autumn had been spent in flowers and fruits. They are to be felled upon the waning of the moon: since the sap that can cause timber to deteriorate will have been expended in this time, it will not be easy for the woodworm to enter them. They should be cut at the beginning up to the middle of the heartwood only, and left as long as possible until they are drained and dried up. While the sap that engenders woodworm is exuded, the cut timbers should be laid in a place where they will not be exposed to the sun, wind, or rain, and these should be kept mainly under the roof, (but) kept as they are and naturally, they will bud and grow. So that they will not split and dry out evenly, it is useful to daub them with fresh cow manure. They should not be hauled when the land is damp with dew until midday, nor they should be hewn when they are wet with dew or when they are too dry, because in the former case they easily rot and in the latter, they are badly hewn. Three years are required for them to dry out adequately, especially for those who want to build doors, windows, altarpieces, and other machines. They should carefully learn and ask the practitioners and experts of the land about the nature and properties of the timbers and what is suitable for each thing and what is not. Read Vitruvius, who discusses these points at length in the place cited above.

As for the time to cut, since in this land there is no winter it seems that [fol. 87] the best time will be when the trees have already borne all their flowers and fruit. What woods are suitable here for each thing?

[28] *Durmiente*: Dormant or dormer; Wall plate, a horizontal, structural, load-bearing member in wooden building framing.

[29] Most probably copied or lifted from Book 1 Chapter 2 of *The Architecture of A. Palladio*. (This website: https://maestronet.com/forum/index.php?/topic/332112-vitruvius-on-timber-harvesting-and-uses/ was also consulted for the translation.)

Medidas de las maderas del techo de una casa

[1.] Las llaves si no ay corredor ni tránsito han de tener de largo lo que ay del centro del un arigue o columna al centro del otro y mas bara y media mas, p*ar*a que salgan afuera de los arigues media bara por cada lado, y si la fabrica es de pilares, han de salir las llaves media bara por cada lado afuera de los pilares si ay corredor han de salir por aquella banda, 3 palmos y ½ fuera del arigue, o pilar de la banda del tránsito han de salir media bara fuera del arigue o pilar para la firmeza del tarugo de ancho y grueso an de tener a lo menos 7, y 8, puntos o 7, 7 si son de molaves.

2. El quilo o tixera tiene de largo dos tercias de lo que tiene la llave de centro a centro del arigue o pilar, según lo que se acostumbre en Manila, pero no se debe usar por ser mucha corriente y de ancho y gordo 4 y 5 puntos, o 4 y 3, si es de Molave el atravesaño de la tixera es la mitad (o mitad y un palmo mas) de la tixera o quilo, y su ancho y grueso 4 y 3 puntos o 3 y 3 si es de molave.

3. La sobretixera o sobrequilo si no ay corredor ni tránsito no ha de tener menos de 4 baras, si ay corredor y este no passa de una bara bastan 4 baras de sobretixera o sobrequilo si el corredor su ancho passa de 4 palmos p*o*r cada palmo que passa se ha de añadir una bara al sobrequilo de suerte que si el corredor tiene de ancho una braza el sobrequilo ha de tener 6 baras de largo el grueso y ancho del sobrequilo es de 4 y 5 puntos, o de 4 y 3 si es de molave.

4. Las aletas de un tránsito si el ancho del tránsito tiene 4 baras han de tener 8 baras, si el tránsito tiene 3 baras de ancho tenga la aleta 7 baras, si el tránsito tiene 5 la aleta tendrá 9 si el tránsito tiene 6 la aleta tendrá 10, y de grueso tendrán 6 y 5 o 5 y 5 puntos o 5 y 4 si son de molave.

5. Los canes o boncalos si son para harigues basta que sean de 6 o 7 palmos si p*ar*a pilares han de salir una tercia por cada banda afuera del pilar. Los canes o boncalos entre las llaves p*ar*a cargar las cintas de las tixeras (dagan) o las de la sobretixeras (batayan) han de tener de largo 6 palmos si no ay pared y si la ay han de salir una tercia por cada banda fuera de la pared y todas han de tener de ancho, y grueso lo que tienen las llaves.

House roof timber measurements

[1.] If there is no *corredor* or *tránsito*,[30] the roof beams must be as long as the distance from the center of one ***arigue***[31] or column to the center of the other, plus a *bara* and a half more, so that they protrude outside of the posts half a *bara* on each side. And if the work is of pillars,[32] the roof *llaves* must protrude half a *bara* on each side of the pillars. If there is a *corredor*, they must protrude on that side 3 and a half *palmos* beyond the *arigue*, or pillar. From the side of the *tránsito* they must be half a *bara* beyond the *arigue* or pillar. For the firmness of the *tarugo* the width and thickness must measure at least 7, and 8, *puntos* or 7, 7 if they are molaves.

2. The length of the *quilo* or *tixera* is two thirds the length of the roof beam from center to center of the *arigue* or pillar, as is customary in Manila, but it should not be used for its being too common. The width and thickness must be 4 and 5 *puntos*, or 4 and 3 if it is of molave. The *atravesaño* of the *tixera* is half (or half and a *palmo* more) of the *tixera* or *quilo*, and its width and thickness are 4 and 3 *puntos* or 3 and 3 if it is of molave.

3. If there is no *corredor* or *tránsito*, the *sobretixera* or *sobrequilo*[33] [over-principal] must not have less than 4 *baras*; if it has a *corredor* that is not more than a *bara*, then 4 *baras* of *sobretixeras* or *sobrequilos* are enough. If the width of the *corredor* is more than 4 *palmos*, a *bara* is added to the *sobrequilo* for each additional *palmo*, so that if the *corredor* is one *braza* wide, the *sobrequilo* must be 6 *baras* long. The thickness and width of the *sobrequilo* are 4 and 5 *puntos*, or 4 and 3 if it is of molave.

4. The ***aletas***[34] [extended beam supports?] of a *tránsito* which is 4 *baras* wide must have 8 *baras*; if the passage is 3 *baras* wide, the *aleta* shall be 7 *baras*; if the *tránsito* has 5, the *aleta* shall be 9; if the *tránsito* has 6, the *aleta* must have 10. The thickness shall be 6 and 5, or 5 and 5 *puntos*, or 5 and 4 if they are of molave.

5. If the corbels or *bongcalos* are for the *harigues*, it is enough that they are 6 or 7 *palmos* and if for pillars, they must protrude a third for each part that extends from the pillar. The corbels or *boncalos* between *llaves* for carrying *cintas* of the *tixeras* or ***dagan***[35] or those of the *sobretixeras* or ***batayan***[36] must be 6 *palmos* long if there is no wall. If there is a wall, a third must protrude on each part beyond the wall. In all cases, they must be as wide and thick as the *llaves*.

[30] Probably refers to the cantilevered gallery extending from the façade, that is called a *volada*.

[31] *Arigue*: wooden column or housepost.

[32] Albarran here differentiates posts or columns from pillars.

[33] *Sobrequilo*: over-principal, syn. with *batayan*.

[34] Literally, an *aleta* is a small wing; it is entered later in the text as a kind of *sobretixera* (rafter over a rafter) in the context of the *corredor* or *tránsito*, which seem to be the equivalent of what would be called the *volada*.

[35] *Dagan* (from Cebuano, to run): rafter, synonymous with *quilo* and *tixera* in this text.

[36] *Batayan* (from Old Tagalog): a piece of lumber placed over another timber. Syn. with *sobrecan*, *sobrequilo*, and *sobretixera* in Albarran's text.

6. Los anamanes han de tener de largo lo que ay de centro a centro del arigue o pilar a lo largo de la casa y una tercia de bara mas p*ar*a don*d*e se juntan entre si de grueso y ancho lo que las llaves.

7. Las cintas que reciben las tixeras (dagan) han de tener de largo lo que los anamanes, y de ancho y grueso, 4 y 5 puntos o 4 y 3 si son de molaves; pero si las tixeras son muy largas tendrán 6 y 5 puntos o 5 y 4 si son de molabe.

[fol. 87v] 8. Las cintas que reciben las sobretixeras (batayan) han de tener de largo lo que las anamanes, y de grueso y ancho lo que los daganes n. 6.

9. Los sobre cavalletes, o palos que lo forman (*olong bobong*) han de tener de largo lo que los anamanes y de ancho y grueso 4 y 4 puntos si los quilos o tixeras son largas, o 4 y 3 si son de 3 brazas no mas y si son de molave basta que sean 4 y 3 p*ar*a quilos largos y de 3 y 3 para quilos de 3 brazas.

10. Los atravesaños de las tixeras o quilos adonde con su largor alcanzan que sera a las dos tercias del quilo si ellos son la mitad del quilo y si tienen mas se clavarán algo mas abaxo.

11. Las cintas en que estrivan los quilos y tixeras (dagan) y las en que estrivan las sobretixeras o sobrequilos (batayan) han de encaxar en los canes o bongcalos para que no cogen para atrás con el peso del techo, además del clavo con que se clavan en los canes o bongcalos.

12. Los canes, o bongcalos y las llaves han de tener muesca en que encaxen los anamanes para que los canes no cogen para atrás.

13. Para saber donde se ha de asentar el primer quilo d*erech*o y entero (quando el techo por una banda tiene cayda) se parte la distancia del ancho de la casa, de centro a centro del arique o pilar, por me*di*o y tanto ha de distar el primero quilo d*erech*o y entero del centro del arigue último para lo largo de la casa.

Clabaçón

De ocho generos son los clavos grandes.

A. Clavos de 9 puntos de largo, y de grueso arriba 5 ½ pesan 13 ½ onzas.
B. Clavos de 8 puntos de largo, y 4/10 de grueso pesan 12 ½ onzas.
C. Clavos de 7 ½ puntos de largo y 4/10 de grueso pesan 12 onz*a*s.
D. Clavos de 7 puntos y 4/10 de grueso pesan 11 onz*a*s.
E. Clavos de 6 ½ puntos de largo y 3/10 y ½ de grueso pesan 7 ½ onz*a*s.

6. The ***anamanes***[37] [wall plates] must be as long as the length from the center to the center of the *arigue* or pillar along the length of the house, and a third of a *bara* more for where they join each other; they have the thickness and width of the *llaves*.

7. The *cintas* that receive the *tixeras* (*dagan*) must be as long as the *anamanes* [wall plates], and must be 5 and 5 *puntos* wide and thick, or 4 and 3 if they are of molave; but if the *tixeras* are very long, they must be 6 and 5 points, or 5 and 4 if they are of molave.

[fol. 87v] 8. The *cintas* that receive the *sobretixeras* (*batayan*) must be as long as the *anamanes*, and must be as thick and wide as the *daganes* [tie plates for the rafters] n. 6.

9. The ***sobre cavalletes***[38] [ridge beams], or poles which form them (***olong bobong***),[39] must be as long as the *anamanes*, and 4 and 4 *puntos* wide and thick; and if the *quilos* or *tixeras* are long, 4 and 3; and if they are no more than 3 *brazas* long, and if they are of molave, 4 and 3 are enough for *quilos*, and 3 and 3 for *quilos* of 3 *brazas*.

10. The *atravesaños* of the *tixeras* or *quilos* must reach two thirds of the rafter *quilo*, (and) if they are half the *quilo* length or more, they will be nailed a little lower.

11. The *cintas* on which the *quilos* and *tixeras* (*dagan*) and the ones on which the *sobretixeras* or *sobrequilos* (*batayan*) are fastened, have to be fixed to the corbels or *bongcalos* so that they do not hold backwards [do not slide down?] with the weight of the roof, apart from the nail with which they are nailed to the corbels or *bongcalos*.

12. The corbels or *bongcalos* and the *llaves* must have notches in which the *anamanes* will fit so that the corbels will not slide back.

13. In order to know where the first right and whole *quilo* is to be placed (when the roof on one side has a drop), the distance of the width of the house—from center to center of the *arigue* or pillar—is divided by half, and this should be how far away the first right and whole truss must be from the center of the last *arigue* for the length of the house.

Nails

There are eight types of large nails.

A. Nails that are 9 *puntos* long and 5 ½ thick or more, and weigh 13 ½ ounces.
B. Nails that are 8 *puntos* long and 4/10 thick, and weigh 12 ½ ounces.
C. Nails that are 7 ½ *puntos* long and 4/10 thick, and weigh 12 ounces.
D. Nails that are 7 *puntos* long and 4/10 thick, and weigh 11 ounces.
E. Nails that are 6 ½ *puntos* long and 3/10 and ½ thick, and weigh 7 ½ ounces.

[37] *Anaman* (from Old Tagalog): a wall plate, syn. with *cahaban* and *durmiente* in this text.
[38] *Sobre caballete*: Beam placed over the *caballete* (ridge beam).
[39] *Olong bobong* (Old Tagalog and Cebuano): the timber used as a *caballete*; syn. of *sobre caballete* (in this text).

F. Clavos de 6 puntos de largo y 3/10 y ½ de grueso para madres de tabiques pesan 7 onz*a*s.

G. Clavos de 5 ½ puntos de largo y 2/10 de grueso para atravesaños de corredores pesan a 6 ½ onz*a*s.

H. Clavos de 4 ½ puntos de largo y 3/10 de grueso pesan 2 ½ onz*a*s. Para clavar las llaves y vigas en las tirantes que llaman cahabanes o anamanes.

H. p*ar*a clavar los tohinos en los arigues arriba abaxo.

E. para clavar las tirantes o cahabanes en los arigues.

H. para clavar las tirantes o anamanes entre si.

A. para clavar las sobretixeras que llaman aletas o sobrequilos largos del tránsito sobre los anamanes.

A. para clavar las tixeras

B. para clavar las sobrecanes de adentro que llaman cintas o dagan sobre las canes, que llaman bongcalos.

B. para clavar las sobrecanes o dagan entre si? [sic]

C. para clavar las sobretixeras o sobrequilos del corredor sobre los canes o batayan.

C. para clavar las sobretixeras o sobrequilos del tránsito sobre las tixeras, o quilos.

C. para clavar las sobrecanes o batayan sobre las canes o bongcalos.

C. para clavar las tixeras o quilos sobre las sobrecanes o cintas o dagan.

E. p*ar*a clavar las sobretixeras sobre quilos del corredor en las tixeras [fol. 88] o quilos.

D. para clavar el sobre cavallete en las tixeras.

E. para los patindig o madres de tabique y corredores.

F. para clavar atravesaños del corredor.

GH. por menester tantos quenta es la mitad de la demas clavazón grande clavo de baraquilas 3 puntos o dos y 8/10 de largo: de suelo menor 2 puntos y ½ o dos puntos y 3/10 de largo.

Para clavar los anamanes entre si o las tirantes contra los harigues o las aletas sobre los anamanes del tránsito, o los tahinos contra los harigues arriba han de ser los clavos de una tercia o a lo menos de 8 puntos uno un cate.

F. Nails that are 6 *puntos* long and 3/10 and ½ thick for ***madres de tabiques***[40] [vertical partition framing], and they weigh 7 ounces.
G. Nails that are 5 ½ *puntos* long and 2/10 thick for the *atravesaños* [collar beams] of *corredores*, and they weigh 6 ½ ounces.
H. Nails that are 4 ½ *puntos* long and 3/10 thick, and weigh 2 ½ ounces. For nailing the *llaves* and *vigas* to the *tirantes* they call ***cahabanes***[41] or *anamanes* [wall plates].
H. For nailing the ***tohinos***[42] in the posts above and below.
E. For nailing the *tirantes* or *cahabanes* in the posts.
H. For nailing the *tirantes* or *anamanes* to each other.

A. For nailing the *sobretixeras* called *aletas or sobrequilos* of the *tránsito* on the *anamanes* [wall plates].
A. For nailing the *tixeras*.
B. For nailing the interior ***sobrecanes***[43] called *cintas* or *dagan* on the corbels called *bongcalos*.
B. For nailing the *sobrecanes* or *dagan* to each other.
C. For nailing the *sobretixeras* or *sobrequilos* of the corridor on the corbels or *batayan.*
C. For nailing the *sobretixeras* or *sobrequilos* of the passage on the *tixeras* or *quilos*.
C. For nailing the *sobrecanes* or *batayan* on the corbels or *bongcalos*.
C. For nailing the *tixeras* or *quilos* on the *sobrecanes* or *cintas* or *dagan*.
E. For nailing the *sobretixeras* on the *quilos* of the *corredor* on the *tixeras* or [fol. 88] *quilos.*
D. For nailing the *sobrecaballete* on the *tixeras*.
E. For the ***patindig***[44] or *madres de tabique* and *corredores*.
F. For nailing the *atravesaños* of the *corredor*.
GH. It is necessary therefore to count half of the other big nails as nails of the ***baraquilas***[45] that are 3 *puntos* or 2 and 8/10 long: for the floor shorter at 2 ½ *puntos* or 2 and 3/10 *puntos* long.

For nailing the *anamanes* to each other or the tirantes against the *arigues* or the *aletas* on the *anamanes* of the *tránsito*, or the *tahinos* against the top of the *harigues*, they must be a ***tercia***[46] or at least 8 *puntos* [22.28 cm.], (and) each weighs a ***cate***.[47]

[40] *Madre de tabique*: vertical partition framing (based on context). Syn. with *patindig* in this text.

[41] *Cahaban* (from Old Tagalog): wall plate; a horizontal, structural, load-bearing member in wooden building framing. Syn. with *anaman, durmiente* in this text.

[42] *Tohino*: A piece of wood which in this context is inserted into a larger piece to strengthen it.

[43] *Sobrecan*: Corbel superimposed over another corbel.

[44] *Patindig* (Tagalog): to make something stand; synonymous in this text with *madre de tabique*. Cebuano, *patindog*.

[45] *Baraquila*: Purlin, a thin timber stretching horizontally across the principal rafters to support the secondary rafters of one side of the roof.

[46] *Tercia*: a third of a *vara*, equivalent to one foot, 27.86 cm.

[47] *Cate* (Old Tagalog): A weight, originally from China, equivalent to 22.31 English ounces, 1.375 Spanish pounds, or 0.6326 kilos.

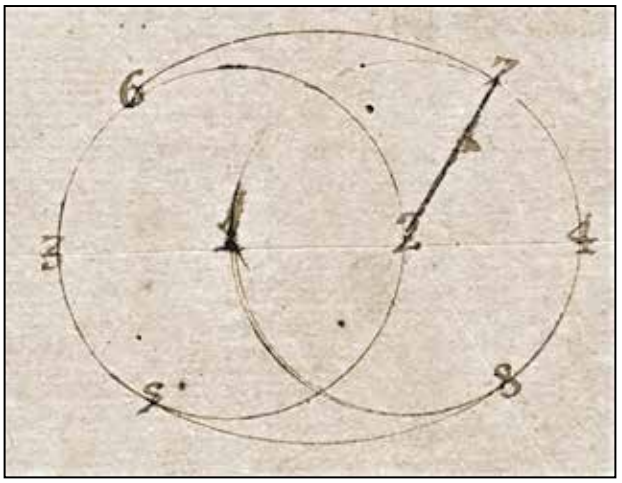
Para clavar las tixeras o quilos arriba entre si o los atravesaños contra las tixeras, o quilos, o las cintas de los quilos (daganes) contra los bongcalos o canes o las cintas de los sobrequilos o sobretixeras contra las canes han de ser clavos de un palmo o 7 puntos de estos 12 pesan 4 cates.

Para clavar los palos del cavallete contra las tixeras han de ser clavos de un geme o de 6 puntos de estos 21 pesan 5 cates.

Para clavar las tixeras y sobretixeras en el pie contra las cintas han de ser clavos de 5 puntos y también para clavar las cintas de tixeras o sobretixeras entre si de estos 21 pesan 3 cates.

Para clavar las sobretixeras arriba contra las tixeras han de ser clavos de 4 ½ puntos o por lo menos de 4 puntos destos 26 pesan 3 cates.

El[4] ovalo generalm*en*te se forma con dos círculos que el uno llegue al otro centro i los centros son 1, 2, i los enquentras de los círculos 3, 4, serán sus centros i puesta una regla en 1, 4 se dará la línea 1.5 i puesta en 3, 2 se da la línea 2.8 i ni mas ni menos las líneas 1, 7, 2, 6 puesto después el pie de compas en el 4 se abre el otro hasta cinco y se buelbe hasta 6, i del centro 3 se da la línea 7, 8 con el compás, i queda formado el ovalo mui agradable que llaman de dos triángulos.



6.a Figura

[4] These last two paragraphs on ovals are from Juan de Arphe's *Varia conmensvración para la escultura, y arqvitectvra* (Madrid: Francisco Sanz, 1675), Libro Primero, Capitulo Tercero, 9v-10.

For nailing the *tixeras* or *quilos* above to each other, or the *atravesaños* against the *tixeras* or *quilos*, or the cintas of the quilos (*daganes*) against the *bongacalos* or corbels, or the *cintas* of the *sobrequilos* or *sobratixeras* against the corbels, they must be a *palmo* or 7 *puntos*, (and) 12 of these weigh 4 *cates*.

For nailing the *caballete* poles against the *tixeras*, they must be nails of ***geme***[48] or 6 *puntos*, (and) 21 of these weigh 5 *cates*.

For nailing the *tixeras* and the *sobretixeras* on the foot against the *cintas*, they must be nails of 5 *puntos*, and for nailing the *cintas* of the *tixeras* or *sobretixeras* to each other, (and) 21 of these weigh 3 *cates*.

For nailing the *sobretixeras* above against the *tixeras*, they must be nails of 4 ½ *puntos* or at least 4 *puntos*, (and) 26 of these weigh 3 *cates*.

The oval is generally formed with two circles that pass each other's center. If their centers are 1 and 2, and if the intersections of the circles are 3 and 4, these will be their centers; place a ruler in 1 and 4, and draw a line between 1 and 5, and put a line in 3 and 2, and draw a line between 2 and 8, and neither more or less the lines 1, 7, 2 and 6, then put the compass foot (needle) on 4 and open the other one to to 5 and back to 6, and draw a line (an arc) between 7 and 8 with center 3 with the compass, you will form a very nice oval called two triangles.

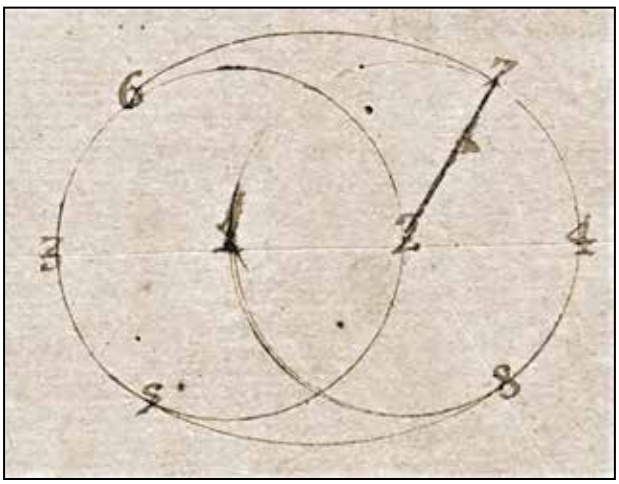
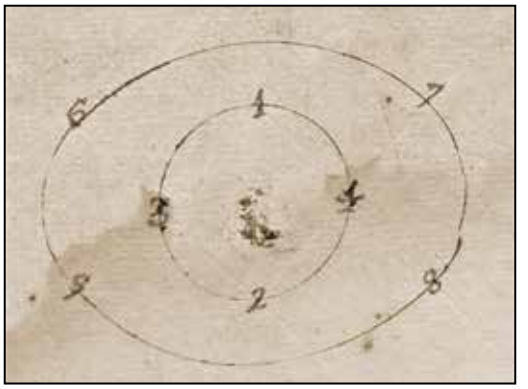


Fig. 6

[48] *Geme*: from the context, a length measuring 6 puntos, or 16.716 cm.

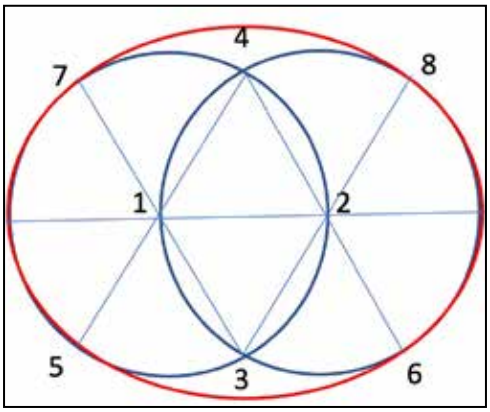
Formase de otra manera el ovalo i es un circulo echo quatro p*ar*tes/que son 1, 2, 3, 4 i puesta la regla en 1, 4 se da una línea 1, 8 i puesta después en 1, 3 se da la la [sic, repeated] línea de 1, 5 i ni mas, ni menos se dan las líneas de 2, 6, 7, puesto después el un pie del compás en el centro 2. se habre lo que [fol. 88v] se quisiere i se da la línea 6. 7. i alçado de aquí se sienta en el centro 1. y se da la línea 8. 5 después se pone el pie del compás en el 3, i se hiciera asta el punto 6. i de allí se buelbe asta el punto 5. i del punto 4 se da la otra línea de 7. 8 con lo que queda cerrado el obalo.



7.ª Figura

The authors express their heartfelt gratitude to Fr. Policarpo Hernández, O.S.A., Archivist of the Archivo de la Provincia de Agustinos Filipinos (Valladolid), for access and permission to publish Fr. Albarran's Advertencias and Barias Reglas de Arquitectura; Roberto Blanco Andrés; and Architect Michael Manalo, for invaluable assistance in this project.

[Probably Correct Drawing/Numbering for Method 1][49]



Form the oval another way. Given a circle with four parts 1, 2, 3 and 4, put the ruler in 1 and 4 and draw a line from 1 to 8, and then put the ruler in 1 and 3 and draw a line from 1 to 5, and no more or less, draw the lines from 2 to 6 and 7, put the foot (needle) of the compass in the center 2 and open the other, and draw a line (an arc) between 6 and 7, lifting (the foot) from here and setting it in 1, draw a line (an arc) between 8 and 5, then put the foot of the compass in 3, and make a line (an arc) up to point 6 and then back up to point 5, and in point 4, draw another line (arc) between 7 and 8 that will close the oval.

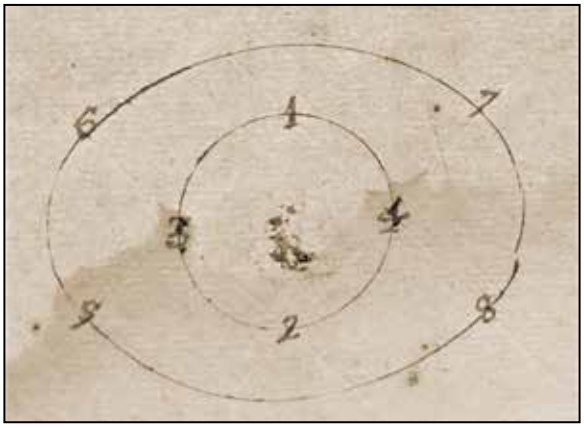


Fig. 7

[49] Reference: https://dibujotecni.com/geometria-plana/ovalo-ovoide-espirales/.

Glossary of Selected Terms Used by Fray Albarrán

Legend:

Ceb.	Cebuano
OSp.	Old Spanish
OTag.	Old Tagalog
Sp.	Spanish
Syn.	Synonymous with

The terms included here are spelled as in the Albarrán text. Their modern spelling is enclosed in brackets.

Some definitions in dictionaries do not match the usage in the text; their meanings have been hypothesized through the context.

Contemporary equivalents in Spanish and English are taken from Santiago Porras y Alvarez, an architectural historian, 1992: 16.

aleta. Sp., 'little wing.' The meaning here is not clear; it is entered as a kind of *sobretixera* (rafter over a rafter) in the context of the *corredor* or *tránsito*, which seem to be the equivalent of what would be called the *volada*.

anaman. OTag. A wall plate: a horizontal, structural, load-bearing member in wooden building framing; https://www.wordsense.eu/anaman/; Porras 1992: 16. Based on context the researcher agrees with the Porras translation of wall plate. Syn. with *cahaban*, *durmiente* in Albarran's text. The word *alaman*, used in a 1699 house inventory, resembles the same function:

Ensima de los cabesas de todos los dichos harigues estan veinte pedasos de llaves de poquito mas de a dos brazas de largo que sirven de *alamanes* ... (Zialcita 1980: 254).

arco de carpanelo [*carpanel* or *arco carpanel*]. Sp. Basket-handle arch. This arch has a rise not greater than half of its span. Ching 1997: 289. Alcayde et al 2019: 1-18. The archaic spelling *carpanelo* appeared in one of the sources consulted by the translator: *carpanelo apaynelado* was one of the five types of arches in Fray Lorenzo de San Nicolás, O.S.A, *Arte y Uso de Arquitectura* 1796: 91 (First edition, 1639). *Arco carpanel* is also called *arco apaynelado*: Brizguz y Bru 1804 (First edition, 1738): 6.

arco de carpanelo mayor. Higher basket-handle arch, formed from two tangent circumferential arcs.

arco de carpanelo menor o rebajado. Lesser or lowered basket-handle arch, formed from three tangent circumferential arcs.

arco de medio punto. Sp. Half-circle arch, also called semicircular arch or *arco romano* (Roman arch). The rise of this arch is equivalent to half of the span. Ching 1997: 25.

arigue; also spelled *harigue* in this text [*haligi*]. Tag. and Ceb. Wooden column or housepost.

armaçon [*armazón*]. Sp. Framework.

atravesaño [*travesaño*; now *jabalcón*]. Sp. Collar beam. Porras 1992: 16. The shorter collar beam that connected a pair of *quilos* or rafters (now *pares*) two-thirds from their lower edges corresponded to the *nudillo* of the *par y nudillo* truss system utilized especially in Mudéjar architecture.

balao/ *balau*. Resin obtained from the *apitong* (*Dipterocarpus grandiflorus*) and *panau* (*Dipterocarpus gracilis*): from https://fasps.denr.gov.ph/index.php/resources/glossary-of-terms/balau.

bara [*vara*]. Sp. 3 *piés* (feet) or 0.836 m.; equivalent to one yard. For wood, the *vara* is divided into 30 equal parts called *puntos*. 1 *punto* = 2.786 cm. The *vara* is also divided into 4 *cuartas* or *palmos*; 1 *cuarta* = 12 *dedos* (fingers), and 1 *palmo* would be 20.9 cm. Irureta 1896: 38.

baraquila. Possibly from OSpan. *barrar* to bar, and OTag. *quilo*, rafter. Purlin, a thin timber stretching horizontally across the principal rafters to support the secondary rafters of one side of the roof. Jose 1991: 192.

barateja; *baratija*/ *varateja* in other sources. Not in Sp. dictionaries; but equivalent to *correa*, cincture. Possibly OSp. *barrar*, to bar, and Sp. *teja*, roof tile). A rafter on which roof tiles were aligned. Jose 1991: 192. Porras 1992: 16. Zialcita 1980: 243.

batayan. OTag., from *batay*, to place two pieces of wood with the center of one over the other, as in a cross (San Antonio: 36). A piece of lumber placed over another timber. Syn. with *sobrecan, sobrequilo,* and *sobretixera* in Albarran's text. Also defined as over-principal in Porras 1992: 16.

bongcalo. OTag. Corbel; a piece of timber laid horizontally on a pillar, to support a beam. Syn. *can* (in Albarran's text) and with Sp. *zapata*. San Buenaventura 1613: 634.

braza. Sp. 2 *varas*, equivalent to one fathom or 1.671810 m. Irureta 1896: 39. Zialcita 243.

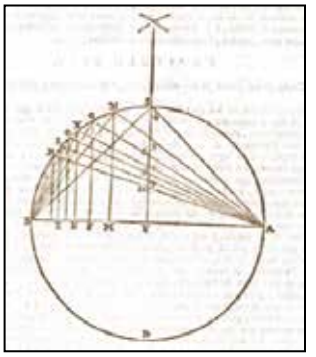
cavallete [caballete]. Sp., diminutive of *caballo*, horse. Ridge beam, a structural member used to support the ends of the rafters at the ridge. Porras 1992: 16.

cahaban. OTag, from *haba*, long. Wall plate; a horizontal, structural, load-bearing member in wooden building framing (Porras 1992: 16). Syn. with *anaman, durmiente* in Albarran's text. Defined as *solera* (Sp., crossbeam), in San Buenaventura 1613: 637.

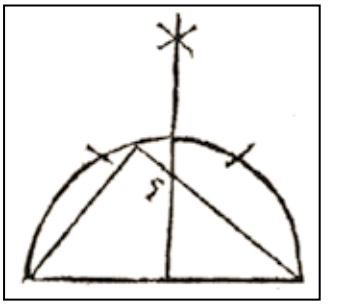
can. OSpan., trigger of a firearm. Corbel. Syn. with *bongcalo* in Albarran's text.

cartabón de cinco. Sp. Set-square of 5 (Lluís i Ginovart 2017: 194-203). "From Italian *quarto bono*, signifying that the right angle was the 4th part of a circle; ... The *cartabón de cinco* was obtained by joining the extreme points of the space of a framework with those divided into five equal parts the circumference drawn on it as a diameter. It was used in the tracing of plans for frameworks" (*Enciclopedia Universal* 1908-1930, 11: 1422). The set-square of five

refers to the five right triangles that can be inscribed in a semicircle (Javier de Mingo 2016). It could have also referred to the right triangle whose smaller side lies on a side of a pentagon inscribed in the circumference of a circle (Porras 1992: 16-18). Porras translates *cartabón de cinco* to fifth triangle (a right-angled triangle) and posits that Albarran could have accessed the work of the Augustinian Fray Lorenzo de San Nicolás (1796/1639: 109). Figure A below shows a drawing from the treatise of Fray Lorenzo on how to derive four to ten *cartabónes*. The fifth triangle is obtained by first dividing the radius YB into 3 equal parts denoted here by segments YM, MN and NB. Then, a line parallel to line SY from point M until the point of intersection at the circumference at point N is drawn. Lines NA and NB are traced and here, NB will be the side of the aforementioned pentagon and the right triangle formed by the segment of NA intersecting line SY and the radius YA will be the *cartabón de cinco*. The slope of this right triangle will define the slope of the trussing system and its hypotenuse will be the length of the rafters. An earlier treatise by Arenas shows a similar configuration as shown in Figure B (López de Arenas 1633).



A. de San Nicolás (1796/1639)



B. Arenas (1633)

As diameter AB in Figure A corresponds to the width of BB in Albarran's drawing, it is 8 *brazas* wide such that line AY measures 4 *brazas*.

cate. OTag. A weight, originally from China, equivalent to 22.31 English ounces, 1.375 Spanish pounds, or 0.6326 kilos. 3 cates de Manila = approximately 2 kg. The Manila cate was slightly heavier than the cate in China. Irureta 1896:44.

cinta. Sp. (now *vigueta*). Purlin; tying plate. Porras 1992: 16.

cinta batayan. Tying plate of the over-principals. Porras 1992: 16.

cinta dagan. Tying plate of the principals. Porras 1992: 16.

corredor. Sp. Based on context, this could refer to a cantilevered running gallery across or extending from the façade, later called the *volada*. Synonymous in Albarran's text with *tránsito*.

dagan. Ceb., to run. Rafter, syn. with *quilo*, *tixera* (in Albarran's text).

durmiente. Sp., sleeper. Dormant or dormer. Jose 1991: 199. Wall plate, a horizontal,

structural, load-bearing member in wooden building framing. Porras 1992. A timber whose end rests on another. *Enciclopedia Universal* 1908-1930, 18-2: 2620. Syn. with *anaman* or *cahaban* in Albarran's text.

geme. Sp. From the text, a length measuring 6 *puntos*, or 16.716 cm.

For nailing the *caballete* poles against the *tixeras*, they must be nails of ***geme*** or 6 *puntos*.

humor. Sp. "In proper Spanish and in a literal sense, the word humor can only refer to the liquid contained in a body." *Enciclopedia Universal* 1908-1930, 28-1: 687.

llave. Sp., key (now *tirante*). Tie beam, a horizontal beam connecting two rafters in a roof or roof truss. Porras 1992: 16.

madre de tabique. Sp., mother of a thin wall. Vertical partition framing (based on context). Syn. with *patindig* in Albarran's text.

molave. *Molave* is the Spanish corruption of the Tagalog term *mulauin*. The *molave* (*Vitex parviflora* Juss.) was the quintessential timber used in pre-Hispanic and Hispanic periods. It was referred to as the queen of Philippine woods by Franciscan missionary Juan Francisco de San Antonio for its durability (Fadriquela 2: 34). Wood species with prefixes of *mulau*, *mugau*, *murau*, *bulau*, etc. denote its yellowish nature (Reyes 1938).

olong bobong. Tag., 'head of the roof.' *Bobong*, Ceb., the timber used as a *caballete* (Encarnación 1885: 61); *olo*, Ceb., head (Encarnación 1885: 358). Syn. of *sobre caballete* in Albarran's text.

palmo. Sp., palm. The fourth part of a *vara*. Irureta 1896: 38; *Enciclopedia Universal* 1908-1930, 41: 449. With the *vara* at 0.836 m., a *palmo* would be 20.9 cm.

patindig. Tag., to make something stand. Syn. with *madre de tabique* in Albarran's text. *Patindog*, Ceb., a post of wood or other material that is used for any framework (Encarnación 1885: 396).

pié. Sp., a measure of 12 *pulgadas*, or one foot; a third (*tercia*) of a *vara* (with the *vara* at 0.836 m., one third would be 27.86 cm.) Irureta 1896: 38.

punto. Sp. One of 30 equal parts of a *vara*; with the *vara* at 0.836 m., 1 *punto* = 2.786 cm. 5 *puntos* to measure wood = 14 cm. Irureta 1896: 38.

quadrar [cuadrar]. Sp. to square.

quilo. A filipinism, not found in other Spanish dictionaries (but equivalent to Sp. *par*). Principal rafter, truss, syn. with Sp. *tixera* in Albarran's text. Jose 1991: 208. Porras 1992: 16. Zialcita 1980: 243.

sobre caballete. Sp. Ridge beam; beam placed over the *caballete* (ridge beam). Syn. with OTag. *olong bobong* in Albarran's text.

sobrecan. Sp. Corbel superimposed over another corbel. Cruz de Amenábar 2017: 56.

sobrequilo. Combination of Sp. and OTag, over the *quilo*. Over-principal. Porras 1992: 16. Syn. with *batayan* in Albarran's text.

sobretijera. Sp. Jack rafter or false rafter; a rafter placed over another rafter. Over-principal. Porras 1992: 16.

tarugo. Sp. Thick dowel or nail of wood. *Enciclopedia Universal* 1908-1930, 59: 825.

tercia. Sp., a third of a *vara*, equivalent to one foot; with the *vara* at 0.836 m., a *tercia* or one third would be 27.86 cm. Irureta 1896: 38.

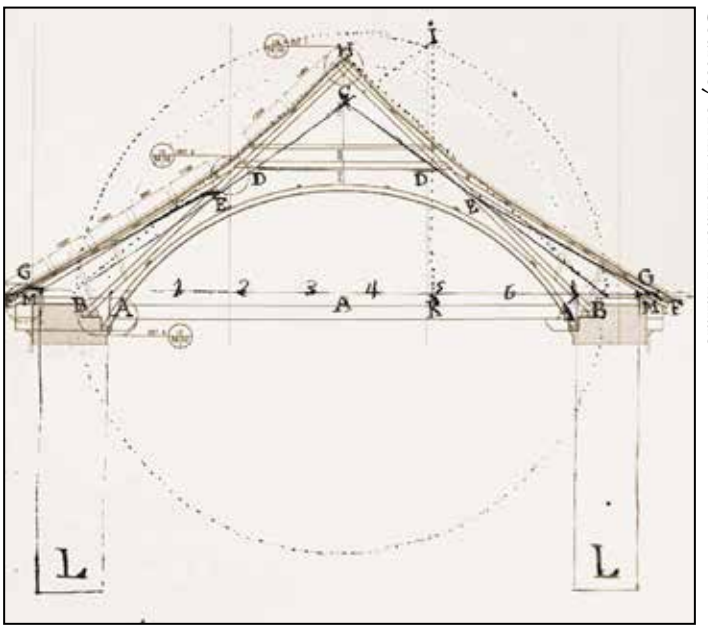
tixera [*tijera*, now *par*]. Sp., scissors [hence, the folding cots in the inter-island ships are also called *tijeras*]. Rafter, principal rafter. Porras 1992: 16. Syn. with *dagan* and *quilo* in Albarran's text.

tirante. Sp., from *tirar*, to pull. Tie-beam. Porras 1992: 16. Syn. with *llave* and *viga* in Albarran's text.

tohino. Sp. [*tojino*]. A piece of wood; in Albarran's context, this is inserted into a larger piece to strengthen it.

tránsito. Sp., passage. Based on context, this could refer to a cantilevered running gallery across and extending from the façade, later called the *volada*. Syn. in Albarran's text with *corredor*.

viga. Sp. Tie beam. Porras 1992: 16. Synonymous with *llave* and *tirante* in Albarran's text.



Courtesy of Ar. Michael F. Manalo

Cross section of trusswork of the parish church of Patrocinio de Maria, Boljoon, Cebu, superimposed on Albarrán's diagram (Fig. 5). This is an example of how Fray Albarran's Barias Reglas influenced subsequent architecture in the region, particularly the church in Boljoon which was begun in the last quarter of the 18th century but finished around 1801, the date on its façade.