The
Architectural Record.

VOL. VII. JANUARY-MARCH, 1898. No. 3.

PALLADIO AND HIS WORK.

IN an age like ours, in which historical research is pushed to extreme limits, it is curious to find that neither the family name nor the birthplace is known of so celebrated a man and an architect at Palladio!

One of his contemporaries, Paul Gualdo, who wrote a life of him in 1749, states that Palladio was born in 1508, but this date was disputed as soon as Temanza published, in Venice in 1778, a remarkable work on the lives of her most celebrated architects and sculptors. Joseph Smith, it will be remembered, had a portrait of Palladio by Bernardino Licinio (called the Pordenone) with the following inscription: B. Licinii opus Andreas Paladio a Annorum XXIII. MDXLI. The portrait mentioned by Temanza was afterwards engraved, according to Magrini—the author of an excellent study on the life and work of Palladio, which is scarce now. Be this as it may, the portrait by Licinio, which is dated 1541, represents Palladio at 23, indicating that our architect was born in 1518 and not 1508, as stated by Gualdo.

The Abbé Zanella, who published a life of the architect, on the celebration at Vincenza of his 100th anniversary, accepted the date of the Licinian portrait; but the study is drawn up altogether on the assumptions of Magrini.

However, putting aside this detail, we find ourselves again uncertain as soon as the reader is curious to know (like Dante in hell in the presence of Farinata degli Uberti) of the ancestors of our hero. All we know about the family of Palladio is that his father's name was Peter, and it was only a few years ago that it was discovered he was a miller at Padua. Not even his surname is known. We know only from a record of Sebastien Liviera, who lived in the second half of the seventeenth century, that our artist received the name of "Palladio" from Jeangeorge Trissino (a noble litterateur and classic enthusiast) in consequence of the vivacity of his talent, in the same

way that Alexandre Maganza (a painter of renown and a friend of our architect) was called Terpandro, and all for that ardent love of the classical which existed in Italy during the fifteenth and sixteenth centuries, the numerous and singular causes of which it is unnecessary to speak of here.

Palladio, then, was born at Vicenza, that pretty city in Venetia, and we know him by a surname only, and one that is not the name of his family. His origin was humble enough, but he had the good fortune to become early acquainted with that noble Vicenzan, Jean-georges Trissino, and it was from him he drew his first inspirations.

In his youth Palladio was a member of the masons and stonecutters' corporation, and it is not surprising that from this he subsequently became an architect. This is not unusual in Italy, and Brunelleschi, Antoine da Sangallo, Sansovino, before they triumphed in architecture, exercised those arts which the ancients qualified as secondary. Gualdo says that in his youth Palladio was a sculptor, but we think, in this instance, we should understand by sculpture the art, namely, of carving or cutting in stone.

Connected first with Trissino and afterwards with some of the richest families in Vicenza (such as Porto, Valmarana, Barbaro, Thiene), Palladio was early placed amidst favorable surroundings. Notwithstanding this his financial position was anything but easy, if one may judge by the advances he requested while he was architect of the Basilica at Vicenza. Perhaps his large family, four sons, Marcantoine, Orace, Leonide, Sille (note the classical names) and one daughter, Zenobie, who married, kept him down.

It is not known at what age Trissino became acquainted with the son of the miller of Padua, but it is generally understood that he first met him at his Villa Cricoli, while it was in course of construction, and on which Palladio was working as a mason. This was in 1536, which would go to show that Palladio was born in 1518, rather than in 1508, and that, therefore, Trissino met him for the first time when he was a young man of eighteen. This gives a fresh importance to the date of the Licinian portrait, because if we admit that this date should take the place of that given by Gualdo (1508), then Palladio was twenty-eight when he first met Trissino at Cricoli. It seems more probable that Trissino would encourage a young man of eighteen than one of twenty-eight. The more so as it is here a question of advising him what studies to pursue. Trissino might have met him at Cricoli on some occasion other than the construction of his villa, because the fact of meeting at Cricoli precisely on the occasion of the building of the villa is not on written record, and the statement has been shown to be untrue that it was in consequence of Palladio proposing a magnificent staircase to Trissino that the latter then and for that reason commenced to patronize the simple mason employed on his villa.

To sum up, Trissino inspired Palladio, and had it not been for his protector, Italy probably would not have had Palladio nor Palladian architecture.

Palladio himself says he was always of opinion that the Romans were in architecture, as in many other things, far above those who came after them (this was the opinion of the day). Consequently he studied their monuments, and also the work of Vitruvius, with real delight, but he confesses it was Trissino that directly stirred him to undertake his classical researches.

He made several journeys to Rome, accompanied by Trissino, in order to learn the Greek and Latin languages (perhaps under the direction of Trissino himself) and visited Ancona, Capone, Nimes to study their local Roman antiquities.

Palladio found that it was not possible for him to succeed as an architect simply. He became a writer and a student, and, as a matter of fact, he is well worth quoting, although this is so seldom done.

Palladio visited Rome three times, accompanied by Trissino, who admired Vitruvius not less than that he did Homer, and on a fourth occasion our architect was called to that city in regard to the Basilica of St. Peter. He never tired in his admiration of those latian monuments, which even in the sixteenth century were to him a new revelation.

It is remarkable that Palladio, far from studying the works of Raphael and Michael Angelo, in the Eternal City, addressed himself more particularly to the sources from which these masters drew their artistic inspirations, and this method of investigation, which one might consider as altogether modern, awoke in him a "*talent d'élite*," which as Horace says, is an enemy of all imitations. "Imitatores Servum pecus."

Let us now speak of Palladian art, and of the more important edifices erected by this Vicenzan architect, who, in the course of his artistic education, trusted to the study of monuments above all things, and who built for himself a renown wherever there are enlightened lovers of architecture.

The masterpiece of Palladio is, without doubt, his first work: the Basilica of Vicenza, built upon the most important site in the city. The oldest documents relating to this palace direct us back to 1222, and after that date building after building was destroyed by fire. Thus, Vicenzan writers inform us that it was the prey of fire in 1290, again in 1335, and in 1370, 1374, 1378, was restored and subsequently was rebuilt from top to bottom in 1444 by a vote of the citizens. In fact, we find in a paper dated July 30, 1443, and signed by the Doge François Foscari, and addressed to the Vicenzans who had demanded the pecuniary aid of the Republic in the re-construction, that he, the Doge, before granting their request would like to have a description

THE BASILICA, VICENZA.

of the work to be undertaken and an estimate of the probable cost. This report was furnished. Thereupon a sum of five thousand ducats was granted, to which was added another three thousand ducats in 1446, and the work of building commenced the same year.

The palace was well advanced in 1451, when a great part of it collapsed. This misfortune did not discourage the Vicenzans; on the contrary, by redoubled efforts, they succeeded in getting the interior finished by 1477, and in 1494 the exterior. Afterwards, a large square was cleared in front of the structure, in order to provide a site worthy of its magnificence.

However, it was evidently written that this palace was not built to stand. Vicenzan writers tell us that the whole of one side was in ruins in 1496, in consequence of chains too small and columns too thin—"fu tutto per difetto delle catene di ferro che erano troppo sottili e delle colonne di sotto," as we read in a document of 1496.

Thereupon a celebrated architect of the Republic, Antoine Riccio, of Venice, who built the famous giant's staircase in the Ducal Palace, was sent for, and his advice was to rebuild entirely a large portion of the palace. Prolonged discussion followed, till at last, in consequence of an infamous charge, Riccio, in 1498, had to flee the State, and was succeeded by Georges Spaventa, who made some restoration on a design of his own. Then came Jacques Sansovino, whose ideas were rejected precisely as were those of Sebastien Serlio, Michel Sanmicheli, and Jules Romano.

Thus nearly all the most celebrated architects of Italy were consulted, which shows the importance of the question we here desire to solve, and the interest the Vicenzans attached to their palace.

The failure, justified or not, of the architects mentioned above made the fortune of Palladio, who, in 1545, submitted his ideas, radical, no doubt, but which were supported to some extent by the judgment of Riccio. At this time Palladio was very young, even if we accept the date of his birth given by Gualdo. He presented a draft of what he considered was necessary to be done to restore the structure.

It is proper to state that since Riccio had given his advice, matters had changed very much for the worse. The whole of the other side of the building was in ruins, and from this time it was no longer a question of a total reconstruction or not. A radical solution was necessary, and the work was given to Palladio, whose drawings had demonstrated that he was thoroughly alive to the exceptional gravity of the problem.

In 1549 Palladio commenced work on the Basilica (this Latin name was used in his time) which was not finished till the close of his life, and for this reason the Basilica of Vicenza is always closely associated with his career.

It is curious to note that the Basilica which occupies the first place in the fame of Palladio is not altogether in his style. It does not resemble the Rotunda nor the Venetian churches, nor the Valmarana Palace, nor the stage of the Olympic Theatre—all Palladian construction par excellence. One might complain of too much uniformity—the motif reminding one of Sansovino in the celebrated Library of St. Mark, built at Venice in 1536.

It goes without saying that Palladio was obliged to adapt his design for this building to the old framework that existed, yet he is criticised for having made the ground floor somewhat stunted in comparison with the elegance of the principal story, with its columns rising on pedestals. But here enters the question of height, which Palladio could not alter, and, besides that, the conditions called for the abandonment of pedestals. The discord between the upper columns upon pedestals and the small circular columns of the lower arcade would not have escaped any one. Palladio, like Vignola, Serlio, Sanmicheli, Jean Bullant, Philibert Délorme, raised the column sometimes on a square plinth upon a pedestal, but in this case reason and necessity dictated to the architect the abandonment of any square plinth in order to afford the public a freer passage.

It is well to bear in mind that Palladio had very just ideas on the use of pedestals. He writes that columns without pedestals are preferable to those with them, as the latter obstruct the entry, whereas columns starting from the pavement add to the grandeur and magnificence of the building. Be this as it may, a severe critic must recognize in the Basilica of Vicenza the majestic "ensemble," the beautiful details, the exquisite taste and elegant sobriety of the profile of the capitals, and of the entablatures, which form one of the principal attractions of Palladian architecture.

The success of the Basilica opened for Palladio the road to more important commissions. Before this he had lived in obscurity, and his previous work, the Godi Palace at Lonedo, that of Pisani at Bagnolo, finished in 1544, did not decide his future fame in the same way that the Basilica did, and for this reason, I assert, it was then that he made his début.

It is not necessary here to do more than refer to our architect's important works, and among the more magnificent and celebrated constructions of Palladio is one that must be placed by the side of the Basilica—the Rotunda, a beautiful detached villa built on a sunny eminence in the suburbs of Vicenza, and rising like a beautiful flower amidst the fresh verdure of the country. It was built after the Venetian manner, with a circular central hall. Hence the name Rotunda.

The plan is a cross, the angles of which are filled with quadangular chambers, and on each arm of the cross is a portico of five light columns, surmounted by an entablature decorated with modil-

THE ROTUNDA, VICENZA.

lions and a pediment of easy inclination. In the middle rises a low cupola, such as one sees in an Eastern Byzantine church, but of sufficient elevation to be clearly visible, in spite of its receding lines. The Rotunda is the soul of Palladio. It is a psychological document which reveals the architect's talent with truth and clearness.

In forming a critical judgment of this work, we must in fairness go back to the age in which it was built, and put aside our modern ideas of architecture in general, and of cities in particular. Palladio built the Rotunda before 1589 for Monseigneur Paul Almerico, a learned Vicenzan who was referendary to Popes Pius IV. and Pius V. It become afterwards the property of the Marquis Capra; it is generally known as the Rotunda del Capra. The Rotunda, like nearly all Palladio's constructions, was not finished by its architect, and Scamozzi took the place of the man who planned it. He has been blamed for the low elevation of the cupola and other details, and while he cannot be said to have enjoyed a reputation equal to Palladio's, he is, no doubt, worthy of high esteem. The Villa of Capra has called forth poetical admiration, and has received the praise of Goethe in an interesting description by the author of "Faust."

After the Rotunda, from the point of view of artistic importance, Palladio's next constructions were in Venice.

The moment one speaks of Palladio's churches, one thinks only of San Giorgio Maggiore and the Chiesa del Redentore (Church of the Redeemer). It is seldom remembered that in 1558 he designed the façade of S. Pietro di Castello in Venice, attributed to Smeraldi. It is evident that Palladio's design was disfigured in the execution, but as a composition it is his. He also made the design for the façade of San Francesco della Vigna at Venice, ordered by the patriarch Grimani. It is known that Grimani rejected the design of Sansovino notwithstanding that the church was built by him. However, this façade is not a work that reflects much credit on Palladio, whose name at Venice is associated with the churches of St. George, The Redeemer and the Convent of the Charity.

The Church of St. George was commenced in 1565. After the death of Palladio in 1580 the work was continued with the greatest respect for his plans, and the Church of St. George is therefore one of the edifices by which we can judge him. The plan is a Latin cross, with three aisles, the centre nave approached from without by seven steps. The nave is twice the width of the side aisles. A composite order of columns and pilasters extend around the church, with a height of 10¼ diameters and an entablature equal to one-fifth of them. The arches of the nave have an elevation of 2½ times their width, and the archivolts are supported on Corinthian pilasters. The entire church is covered with a semi-circular vault, in the centre of which rises the cupola.

THE CHURCH OF THE REDEEMER, VENICE.

The façade is embellished by four composite columns which support an entablature, above which is the pediment with acroteria and statues. The two wings are ornamented with an inferior order of Corinthian pilasters, the entablature of which surrounds the façade, and over the two aisles, following the slants of the roof are carried two half pediments which abut against the columns of the principal order. The arched doorway is square-headed and the tympanum consequently is blind.

The façade was built after the death of Palladio, under the superintendence of Scamozzi, following, it must be remembered, the plans

left by Palladio, and to Scamozzi also was entrusted the construction of the cloisters, commenced in 1579 and continued after the death of their designer by an artist named Bortolo—a clever stone carver, and finished only in 1617.

The cloisters, although much less known than the church, are quite as fine, and it would be well were they removed from the oblivion into which they have fallen. They consist of 140 columns, two and two and four and four (at the corners), and the design may very well be held in equal esteem with the best work of Palladio. I regret I cannot reproduce it, and I am not aware of any engraving or photograph of it. I may add that among all the panegyrists of Palladio there isn't one who gives the praise it deserves to the cloister of St. George.

All, however, agree in the extremely favorable opinion they give of the Holy Venetian Church of the Redeemer, the foundation of which was laid by Palladio in 1576. According to current opinion, this is his most remarkable church—a true masterpiece. Perhaps this judgment is partial, because, to say the least, it is cold, flat, uniform, and reminds one of the façade of St. George more than is necessary. The interior, nevertheless, has a solemn and majestic aspect, excepting some details, which are not up to the standard of Palladio's reputation. Like the Rotunda, the Church of the Redeemer has had its poet—viz., Lord Byron, who wrote that when the Capucins assembled to sing in this church it presented to him a scene more religious, more poetic and more picturesque than any Christian temple he had ever visited. This is, of course, a personal opinion and cannot be discussed. Artists have their preferences, and while Byron loved The Redeemer, Foscolo preferred the Dome of Milan, and Shelley that of Pisa.

In the opinion of architects, The Redeemer is a church properly and clearly designed, and its sumptuous appearance always appeals to us.

We have cited the Church of the Charity, and it is here, in the cloister, the actual residence of the "Academy of Fine Arts," that the solemn and elegant architecture of Palladio triumphs. Founded in 1561, and destined for the Lateran Canons, Palladio, as he himself wrote, aimed at imitating the house of the ancients, "La casa degli Antichi," of which he gave a careful description in his "Architecture," from which it appears he thought a great deal of this style of construction. Unfortunately only a part of the building remains. The Corinthian "Atrium" was, with another side of the building, burnt in 1630, but from what remains one can easily imagine it must have been an edifice of the first rank. Writers in general greatly praise the "tablinum" which formed the sacristy of the church, and although one cannot altogether agree with Querenghi, who, in a

letter addressed to the Venetian architect, Selva (who lived in the second half of the 18th century), says that this part was above all praise. Still its sober beauty is admirable, and among the works of Palladio it is particularly interesting.

PALAZZO CHIERICATI, VICENZA.

Returning to Vicenza, we shall find other edifices of Palladio, though not of the first rank, if we accept current opinion, with the exception of the Olympic Theatre, of which we shall speak. It may be proper to remark even in a short study like the present that we

PALAZZO THIENE, VICENZA.

shall endeavor to select only the finest works. And the first edifice worthy of remark, after those already referred to, is the Palace Chiericati, designed by Palladio for Valérie Chiericati in about 1565, and finished after the death of the architect. It is a delicate construction, almost aerial, and simple in composition.

The open intercolumniations gives it a light appearance, as though of metallic construction. In the middle of the second story the order is filled in with windows, and the latter are surmounted by statues almost in the same way as the Ducal Palace at Venice. This results in the superposition of solids over voids, and, from the point of view of apparent stability, is an arrangement not to be encouraged. Nevertheless, in architecture one must not go beyond the reasonable in

insisting on adherence to structural reality merely because the apparent is not the real.

In short, the Chiericati Palace is a little jewel, and, having been restored in 1853-4 by Miglioranza, is, since 1855, the museum of the city. Since 1870 (after being enlarged) it has remained as it is at present.

In another place of importance, the Palace Thiene, the Vicenzan architect gives us a work of altogether different aspect from that which usually distinguishes it. In this place (unfortunately also unfinished, being only one-fourth built by Palladio), one recalls his contemporary Sanmicheli, and his use of rusticated stone work. Purists remark that in a building where rusticated stonework is adopted, the use of the Corinthian order is arbitrary. Those of our confrères who hold that artists should be free in the treatment of their creations will pay small attentions to these details.

The windows of the ground floor in the Thiene Palace are particularly well designed, with their rough stone headings, above each of which an arch springs, the voussoirs of which articulate with the blocks of stone of the wall. It is not here a question of the Palladian style. On the contrary, Sanmicheli made use of this treatment even more than Palladio, and to-day it is still employed in Italy, particularly in the provinces where classical taste prevails: in Tuscany, for example.

Palladio, who altered the architecture of the Romans to suit the exigencies of his time, touched the extreme limit of classic expression in the Palazzo Valmarana and in the Palazzo del Capitanato at Vicenza. The foundations of the Valmarana Palace were laid in about 1566, but only a third part of the structure was finished. In this place, as well as in the Palazzo del Capitanato, opposite the Basilica, Palladio designed a composite order of pilasters, with windows between the columns. We do not understand—we Italians, with our ideas of suitableness—what purpose is served by these large pilasters, which appear of no rational utility. Palladio, who reasoned on architecture more than we do, ought, we think, to have asked himself: Are not these pilasters, with such extremely long intercolumniations, out of scale with the windows? And their functions here is simply decorative. They form no part of the interior construction; in fact, from the point of view of construction, they are a pleonasm, and if in imagination you remove them, the façade, which did not need them, would gain in simplicity and clearness. Here we have a sort of portico, filled with walling and pierced with windows—a poor addition of modern ideas to an ancient conception. It is perhaps also a condemnation of this motif of Palladian architecture that it has been frequently employed by modern architects, although perhaps a more rational use of it is made in North America than in

PALAZZO VALMARANA, VICENZA.

Italy. Neither can we praise these corners in the Valmarana Palace with the little pilasters below and that statue—a kind of caryatid—above, two decorative details absolutely out of scale with the pilasters which fill up the façade. The disproportion which we have just referred to is more noticeable geometrically than in perspective, and, the angles of the palace could only be defended, taken as they are to-day, if the façade were continued with a repetition of the pilasters.

The extreme classic style of Palladio in all its force is evident in another Vicenzan construction—viz., the Olympic Theatre, to which I have already had occasion to refer, and which at present is visited by tourists as a museum or decorated church. It is again a case of

a building left unfinished at Palladio's death, and for which he furnished the designs in 1580, the order for which he received from the "Most Noble Academy of Olympians," founded at Vicenza in 1555.

It should be understood at once that the purpose of this academy was not confined to studies of literary questions. Sometimes the

THE OLYMPIC THEATRE, VICENZA.

programme included the reciting of some classical tragedy. At first use was made of wooden theatres, among which was a celebrated one designed by Palladio in 1562. But the Academy, desiring to possess something lasting after the style of the ancients, entrusted the building of a permanent structure to Palladio.

This theatre is built on an elliptical plan, with seats rising naturally

from the stage, one above the other. At the foot of the steps is the orchestra, and above rise 28 Corinthian columns decorated with an entablature (not too rich), and with a balustrade ornamented by statues. On the other side, opposite this composition, is the front of the sumptuous stage, decorated with an architectural motif of two parts and an attic, divided by columns and demi-pilasters. In the intercolumniations, which are not open, are placed niches containing statues. The architectural design of the niches consists of classical windows with engaged columns, entablatures and pediments.

In the attic or upper story are figurative compositions and a large escutcheon. The ceiling which exists to-day was painted by Jean Picutti in 1828 (the old one being removed, as it was falling to pieces), in imitation of the velarium of the Roman theatres.

The theatre was built by Scamozzi in 1582, to whom we are also indebted for certain constructed perspectives to be seen in the open intercolumniations and in the arched opening of the centre of the stage, which is enriched also with statues not only in the niches, but in front of the columns also of the second story. The statues represent the old founders of the Academy.

The architectural composition of the Olympic Theatre has the same elegant and solemn air which all Palladio's work possess, and creates a certain impression notwithstanding that the forms may be repetitions. Thus this theatre is one of the most singular monuments in Italy, and a most important example of what the love of "tradition" may accomplish by the resuscitation of dead forms.

If one should speak of all the edifices built or projected by Palladio, all the counsel and advice he gave to those Italian cities which sent for him—Venice for the Ducal Palace, Brescia for the Public Palace, Bologna for the Basilica of Saint Petronio, Rome for the Basilica of St. Peters—we should fill an entire volume of the Architectural Record alone. We have, therefore, confined ourselves to those which more particularly exemplify his brilliant talent and inventive style.

Palladio, "Il buon Palladio; il gran Vitruvio nostro," is one of the most important men which the sixteenth century has produced—not so much for his work as for the influence he exercised; and of this influence and of his best pupils we will—amongst other matters—endeavor to treat in the second half of our study.

Alfredo Melani.

Milan, Italy.

THE PROBLEM OF THE LEANING TOWER OF PISA.*

THE study of the architectural phenomena of mediaeval Italy, which has furnished matter for seven magazine articles, including the present one, was originally suggested to the writer by his interest in the Leaning Tower of Pisa. As this interest prompted the beginning of these studies in 1870, and the continuation of them in 1895, it may properly furnish a title-heading for an essay on the problem of the vertical leans and bends, especially in façades, of Italian mediaeval exteriors.

Properly speaking, this essay should be entitled, "The Problem of the Leaning Façade of Pisa," for it is to this feature of the Cathedral that its matter will be mainly devoted. I have nothing new to offer directly, as regards the construction of the famous Leaning Tower, but the facts to be brought out do seem to bear upon its problem and perhaps they offer a solution of its mystery.

II.

To those interested in the curiosities of art and the wonders of travel, it is tolerably well known that the leaning Bell Tower, or Campanile, of the Pisa Cathedral, which is 179 feet high and 13 feet out of perpendicular, has been alternately regarded for several centuries as a freak of constructive daring and as a curious result of the operation of ordinary natural forces. There is a traditional belief that the Tower was built to lean, and there is also a traditional belief that the Tower settled.

Which belief is the older and consequently the authentic one is unknown, and the opinions of modern authorities have been more or less evenly divided.

If the compendiums and encyclopaedias of recent date be reckoned up, the weight of opinion will tend to favor the theory of accident; but this seems only to result from the fact that a compendium naturally takes the easiest way out of a difficulty, is naturally conservative, and naturally unimaginative. The people who build compendiums have not generally the temperament of people who build leaning towers, and consequently do not understand them.

If the recent multitude of unimaginative books, which copy what may be most easily found in other unimaginative books, be left out

*All photographs used in illustration were taken by John W. McKecknie for the Brooklyn Institute Survey, excepting Figs. 2, 12, 15, 19, 21, 23, 25, 26.

FIG. 1.—THE LEANING TOWER OF PISA.

Taken from the upper gallery of the Cathedral choir, to show the well, in which the Tower stands.

of consideration, there is no doubt that a very respectable and authoritative mass of opinions could be collected to the effect that the Tower did not settle and was originally built as it stands.

We quote the work of Ranieri Grassi, "Descrizione di Pisa e Suoi Contorni" (1837), as one of those giving grounds for this faith, in very explicit detail; all the arguments being from matter of fact observations of the masonry construction.

Ricci's "Storia dell Architettura in Italia" is a standard history of Italian mediaeval architecture, and Ricci also has taken sides in favor of an intentional construction, after presenting the arguments of both parties to the dispute. (Vol. I., p. 577.)

On the other hand, it must be admitted that no argument which can be regarded as completely crushing scepticism, has ever been advanced, and that no philosophy of an intentional construction excepting that of pure caprice or daring, has ever been advanced. It is an illustration of this uncertainty, that, as recently as 1884 or 1885, an American architect, Mr. C. H. Blackall, undertook to settle the question by excavations about the foundation of the Tower, which excavations the authorities, having first permitted, subsequently deemed it wise to interrupt, as possibly endangering its stability.

It has just been noted that there are two traditions regarding the Pisa Campanile, and that it cannot be said which is the older. It is, therefore, especially important to point out that the earliest literary mention of a settlement is that found in Vasari's "Lives of the Artists."

In Vasari's "Life of Arnolfo di Lapo" (Vol. I. of the "Lives"), it is said that: "These two architects [Guglielmo and Bonanno], having little experience of the soil of Pisa, did not sufficiently secure their piles, so that the Tower sank before it had attained half its height, and inclined over the weaker side, leaning six braccia and a half out of the direct line, according to the declination of the foundation. This declination is not much observed below, but is very obvious in the upper part, and has caused many to marvel that the Campanile has not fallen or at least exhibited rents."

Subsequent accounts, which often unhesitatingly mention settling foundations as the cause of the lean, are either based upon Vasari's story, although they rarely or never mention their authority; or else they are founded on a peculiarity of construction, which appears to have been the only basis for the story, but which is susceptible of a wholly different interpretation from that which has been put upon it.

The Leaning Tower of Pisa curves toward the perpendicular above the third story, by a delicate series of changes in the pitch of the columns on the lower side, several of the galleries being also built slightly higher on this side. (Fig. 2 best shows this curve.)

FIG. 2.—THE LEANING TOWER OF PISA.

From the point of view best showing the return curve toward the perpendicular.

Hence a presumption that the Tower settled when the third story was reached, because the changes of direction toward the perpendicular in the upper stories are supposed to represent an adventurous acceptance of the hazardous position of the building with such correction toward the perpendicular direction as was subsequently possible. Thus Murray's Guide-Book says: "There can be little doubt that the defect has arisen from an imperfect foundation, because an effort has clearly been made to bring back the upper part to as vertical a direction as possible."

It will put quite a different point on this matter to show that curving leans are found in a number of buildings of this period, under circumstances which make the hypothesis of a settlement occurring before the completion of the building, and corrected by a bend toward the perpendicular during erection, a wholly untenable one.

It is probable that Vasari's account was suggested by the appearances mentioned in Murray. As there is no earlier literary mention of a settlement, we shall observe that Vasari wrote his account four hundred years after the building of the Campanile, which dates from 1174. Meantime (since 1400), the Renaissance indifference to mediaeval art, and the Renaissance misconceptions of it, had infected Italy, while the disasters and depopulation which had befallen Pisa date back to the thirteenth century. In Vasari's days the marriage of the daughter of the Grand Duke of Tuscany was celebrated by white-washing the mediaeval frescoes of the Florence Cathedral, and this is a suggestion of the attitude then prevailing toward mediaeval art. To these causes, Renaissance taste, and the Pisan decadence, we may attribute the weakening of a tradition regarding

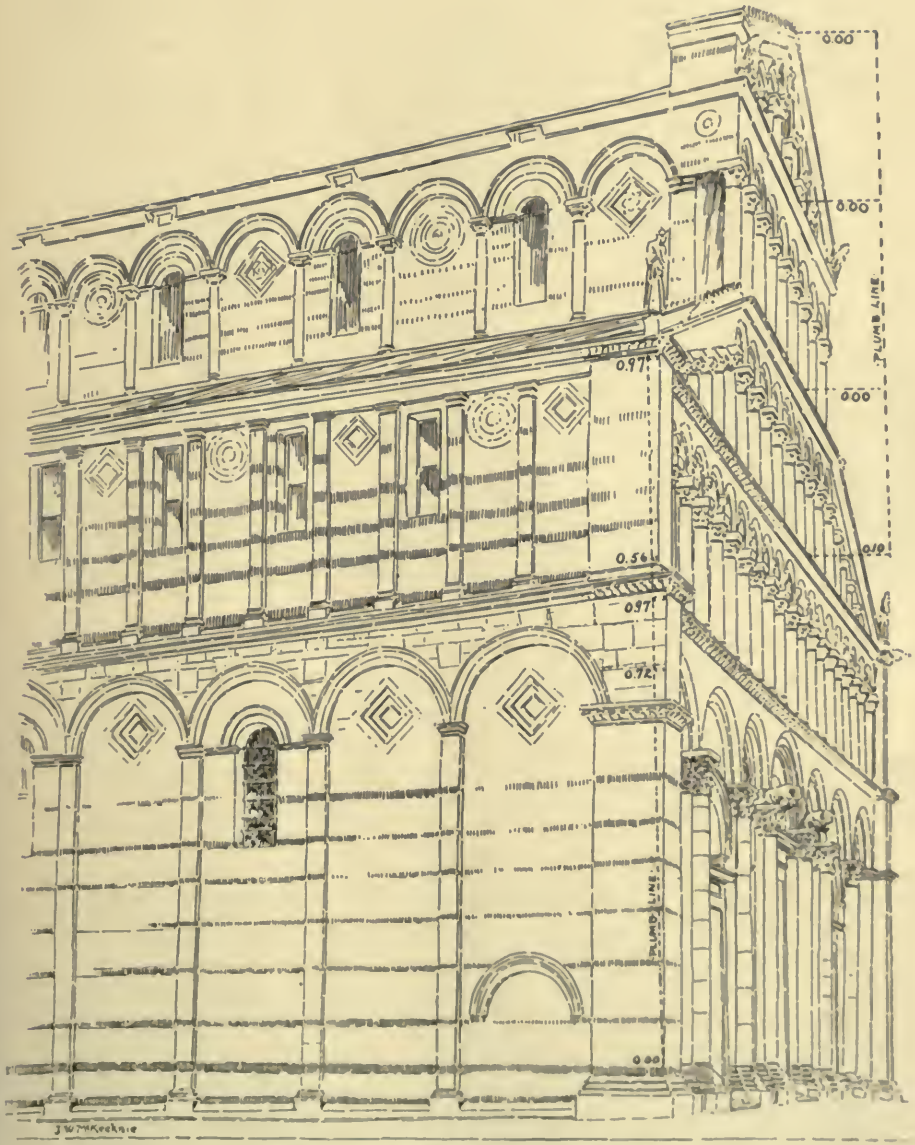


FIG. 3.—THE LEANING FACADE OF PISA

Drawing by John W. McKecknie, made over a survey photograph.

the actual facts, which has notwithstanding persisted down to the nineteenth century.

As to the theory of settlement during construction, there are three drawbacks.

It seems doubtful that masons would have been willing to risk their lives on a tower that had leaned over thirteen feet before the topmost gallery was added, or that workmen would have dared to lift to its summit the seven heavy bells, one of them weighing six tons, which hang there. It seems doubtful that an architect would have so gambled on the chances of the quicksand coming to terms at the proper moment. It seems doubtful that such a quicksand *would* have come to terms at the proper moment, for all time following.

All parties are united on the point that the building has never moved since it was finished. Altogether this was a most obliging quicksand. The sceptics of the nineteenth century will strain at a gnat and swallow a camel. It is easier for them to believe in a quicksand that has been steadfast since the twelfth century than to believe in a constructed leaning tower. All of which is a matter of temperament.

III.

It is a proposition of the writer that among the people of the Middle Ages there were certain daring spirits of an unconventional and possibly refractory disposition, who happened to be engaged in the business of architecture; the Rudyard Kiplings of their time, but having a different medium of utterance; and that these gentlemen were familiar with certain Italo-Byzantine subtleties of habitual but inconspicuous departures from the perpendicular line in building. Hence, on occasion, such eccentricities as the Leaning Tower of Pisa.

The main element of our problem is to prove our own facts; which, being proven, the Leaning Tower of Pisa will take care of itself; as it always has done, being, as it is, the greatest monument in history of hatred for the Philistine and of scorn for the formalist.

And the facts to be proven are held to be these, that there are indubitable evidences in Italo-Byzantine masonry of a habit of substituting vertical bends for mathematically true perpendiculars, and that in exteriors, especially façades, there are cases of bends which begin with a delicate forward lean and which then curve or straighten back to the perpendicular.

Of this class appear to be the façades of the Cathedral of Pisa, of S. Michele at Pavia, of S. Ambrogio at Milan, and the choir of the Pisa Cathedral. The façade of the Cathedral of Ferrara has a forward lean, but apparently without the returning bend. There are

FIG. 4.—THE CATHEDRAL OF PISA.

Aside from the façade this picture shows the downward obliquity of the north transept string-course, which is repeated in reverse direction on the south transept. See survey measurements on Fig. 5. It also shows the curves in plan of the upper north wall. As these curves are potentially due to thrust or accidental movement, they have not been quoted in the article devoted to mediaeval curves.

several other façades in Italy which would be quotable cases of the lean and return bend, subject to careful re-examination, when a probability had been fairly established for constructive intention in one particular case. Observations on the masonry and measurements at Pavia, Milan and Ferrara will be offered after the cases at Pisa have been fully described.

The instances of greatest value, at present, and for an introductory argument, are those of the leaning façade and leaning choir of the Pisa Cathedral. (Figs. 3, 18.)

There seems to be no escape from the conclusion that there is certainly one leaning façade in Italy which was intentionally built both to lean and to bend to the perpendicular. The facts were originally observed by me in 1870, and were originally published in "Scribner's Magazine" for August, 1874, under the heading "A Lost Art."

In 1895, five or six weeks' time were devoted to a survey of the Cathedral of Pisa, in which I had the assistance of two architectural students, whose opinions coincided with my own as to the lean-

ing façade. Measurements were made and photographs taken to support the conclusions reached and the results are offered here. There was probably not a day during the time mentioned in which some attention was not given to the problem of the façade. This amount of careful study was not due to doubts of our own, but to the anticipated doubts of others; of the habitual and professional doubters of the nineteenth century.

The preliminary and essential facts are offered by Fig. 3. Owing to the variety of profiles in cornices and base-moldings and the varied projections of wall surface, connected with the arcade decorations, it is not possible to offer connected measurements at any one point from top to bottom of the façade.

The whole main lower wall along the whole front below the first gallery, leans out evenly and uniformly to an amount which is represented by the measures entered, in foot decimals, on the great corner pilaster at the northwest angle.

As appears from these measures, up to the beginning of the first gallery the forward lean is about one foot (.97) at the angles, and holds at that ratio, for the given height, in the masonry surfaces (arcaded and unarcaded) of the façade proper.

At the first gallery the angle pilaster steps back, so that it is only .56 forward of the face of the lower pilaster at its base, and the whole amount of the lean at the top of the upper pilaster is thus again found to be .97; when measured to the same perpendicular which has been taken for the lower pilaster. The sum total of the lean forward of the upper pilaster, taken by itself, is .41 (.97 — .56).

By adding these two measures; .97 for the lower story and .41 for the upper pilaster, we obtain an approximate estimate for the lean of the continuous main front (as distinct from the separate leans of the upper and lower angle pilasters) in its two lower stories, viz., 1.38, or about seventeen inches. That is to say, if there were a member at the pavement corresponding to the projection of the cornices of the first and second galleries, the lean outward of the upper cornice would have about that amount.

Above the second gallery the measures are entered on the main front itself (Fig. 3). The third gallery leans forward .10; or a little over one inch; and the two upper galleries are plumb.

The height of the two lower stories is slightly in excess of that of the three upper ones (Fig. 4). Thus it appears that the whole lean of the façade is about eighteen inches, of which seventeen inches belong to the lower half; that the three upper galleries are practically plumb and the two topmost ones wholly so.

By looking at the ground-plan (Fig. 5), it will be best seen what forcible projection is given to the bases of the pilasters at the angles of the façade. If a plumb-line be dropped from the apex

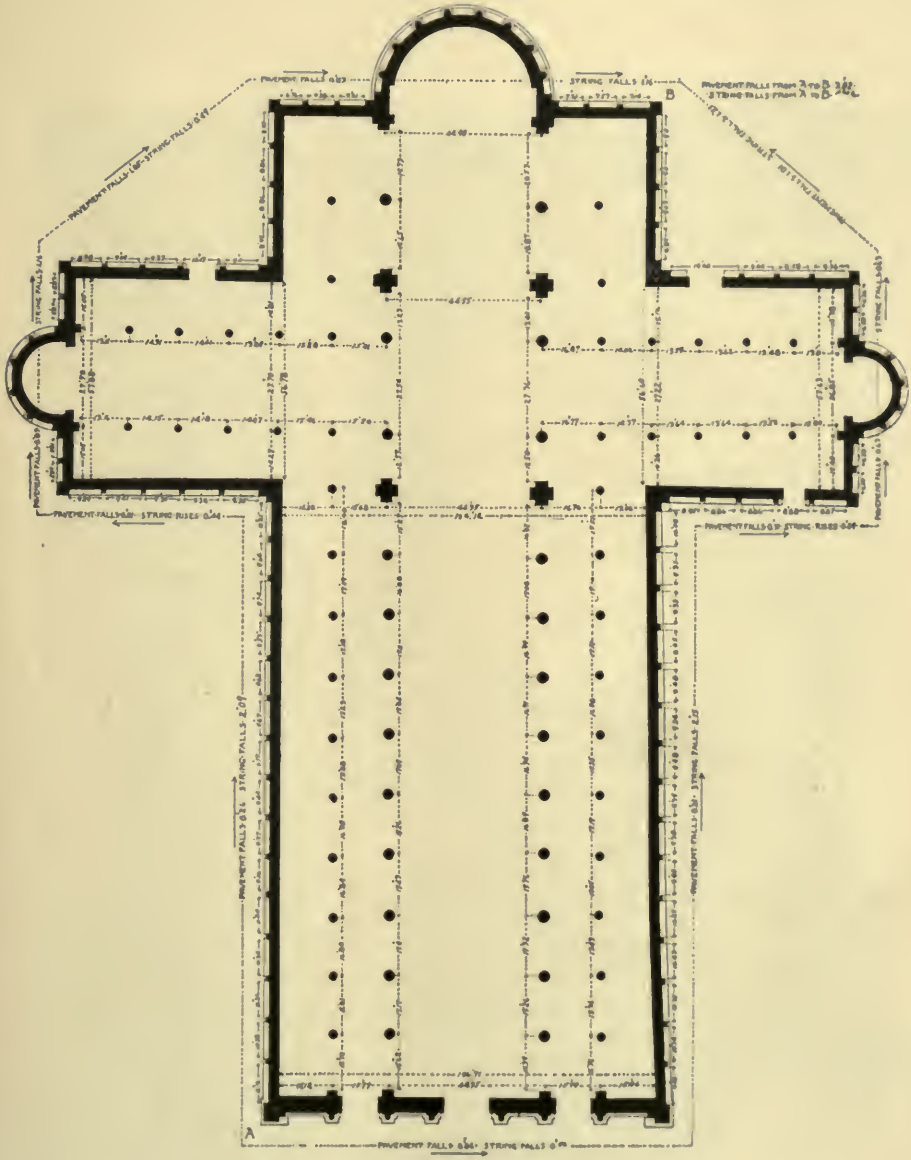


FIG. 5.—GROUND-PLAN OF THE PISA CATHEDRAL.

To illustrate the reinforcement and projection of the angle pilasters and plinths as compared with the lower line of the main façade. The upper main façade does not lean beyond the angle base mouldings (outer line). On this plan are also entered the levels of the pavement, as compared with the levels of the string-course above. On north and south sides the string-course drops about two feet. On the transepts the string-courses drop in opposed directions.

FIG. 6.—SOUTH WALL OF THE PISA CATHEDRAL.

Photographed in parallel perspective to show the obliquity of the string-course. The levels are entered on ground-plan, Fig. 5. The measures to plinth line are entered on elevation, Fig. 10. Note also the downward bend of stripes, arcades and caps at the fifth bay. For measurements see Fig. 13.

of the façade to the pavement, it will strike a point which is on a line with the exterior lines of these bases. Thus, from the standpoint of physics, or of the centre of gravity, the façade is absolutely secure and might be said not to lean at all—in the sense that the topmost cornice moulding does not project beyond the outer line of the plinth blocks at its angles. This is an important fact, when joined to those which follow, showing an intentional construction.

We will now debate the question of settlement, not forgetting that the soil of Pisa is said by geologists to be peculiarly unstable and that quicksands and a treacherously spongy soil are consequently elements to be soberly reckoned with. If settlement occurred, it is evident that outside of a one inch settlement, it was all over when the third story of the façade was finished—a happy accident—similar to the one experienced by the Tower, and to which the Pisan builders must have grown so accustomed as to take it for a matter of course, for it will appear that a similar accident also befell the choir.

But the wonder grows when it appears that even for these two lower stories there must have been at least two separate settlements, and at least one for each story. To show that this must have been the case we will turn to the surveys and photographs of the side walls. (Figs. 6, 7, 8, 9, 10, 11, 13 and 14.)

Beginning on the south side of the Cathedral (Fig. 6), we notice at the fifth bay from the façade a downward bend of the masonry striping, which begins close to the plinth line at the pavement and continues in all courses as high as the capitals of the pilasters.

On the north side of the Cathedral (Fig. 7), we see the same bend at the same point, viz., the fifth bay from the façade.

As the blocks of masonry which form these stripes enter the angle pilasters at a right angle (Figs. 8, 9), it is clear that the obtuse angles of the masonry stripes at the fifth bay on both sides of the church are connected with the leaning façade in such a way that if settlement occurred, it began at the fifth bay.

We now return to a fact brought out by a preceding article (Vol. VI., No. 2), and now shown by surveys in detail (Figs. 10, 11) as well as by photographs.

Although the masonry stripes bend down on both sides at the fifth bay, there is a continuous rise of the central string-course on both sides of the Cathedral, amounting to about two feet, on each side, in the distance between the transepts and the façade. The small photograph, Fig. 12, shows this slope of the south wall string-course in a very emphatic way. It is very clearly seen for the north wall in Fig. 7. The slope is photographed in parallel perspective, and with absolutely scientific accuracy in Fig. 6. The accurate levels for this slope are entered around the outlines of the ground-

FIG. 7.—NORTH WALL OF THE PISA CATHEDRAL.

Showing the oblique string-course and the downward bend of stripes, arcades and caps at the fifth bay. For levels see Fig. 5. For measurements to plinth see Figs. 11 and 14. The string-course curves up toward the façade. The gallery roof-line shows a rising curve in elevation, which is partly constructive and partly an optical effect of the curve in plan shown by Fig. 4.

plan, Fig. 5. The measurements from plinth to string-course for the south wall are entered on Fig. 10. The level measurements for the obliquity of the north wall string-course are entered on Fig. 11. The variations of measures as between levels and plinth measures, and as between north and south walls, will appear from these surveys to be unimportant and we will again mention the obliquity of both north and south string-courses as closely two feet. Figs. 13 and 13A are enlarged sections of Fig. 10, on which the measurements are more easily read.

Thus the string-courses rise obliquely upward toward the façade throughout their whole extent, while the black and white masonry courses fall obliquely as high as the capitals, in the given five bays.

Clearly the settlement supposably represented by these masonry courses did not extend as high as the string-course. Therefore it follows, if there was settlement at all, that there were two settlements; because the angle pilasters lean forward above this string-course. (Figs. 3 and 8.)

FIG. 8.—THE LEANING FACADE OF PISA. SOUTHWEST ANGLE.

Showing in detail the masonry of the south wall. Note the downward direction of stripes, the upward direction of string-course and the downward direction of stripes above the string-course. Compare survey measurements, Fig. 13.

Let us next examine the masonry above the oblique string-courses, and it will immediately appear that the lean of the second story is constructive. In Figs. 6, 7 and 8, we can see the black masonry stripes entering the upper corner pilasters at a right angle and contrasting in their downward direction with the rising obliquity of the string-course below them. If we examine the detail photograph, Fig. 9, which includes the first black masonry line above the string-course of the north wall, we shall see that every block is cut in converging lines, or in wedge fashion. The same cutting of wedge-shaped blocks is seen in multitudes of blocks just below the string-course, showing how its obliquity was obtained.

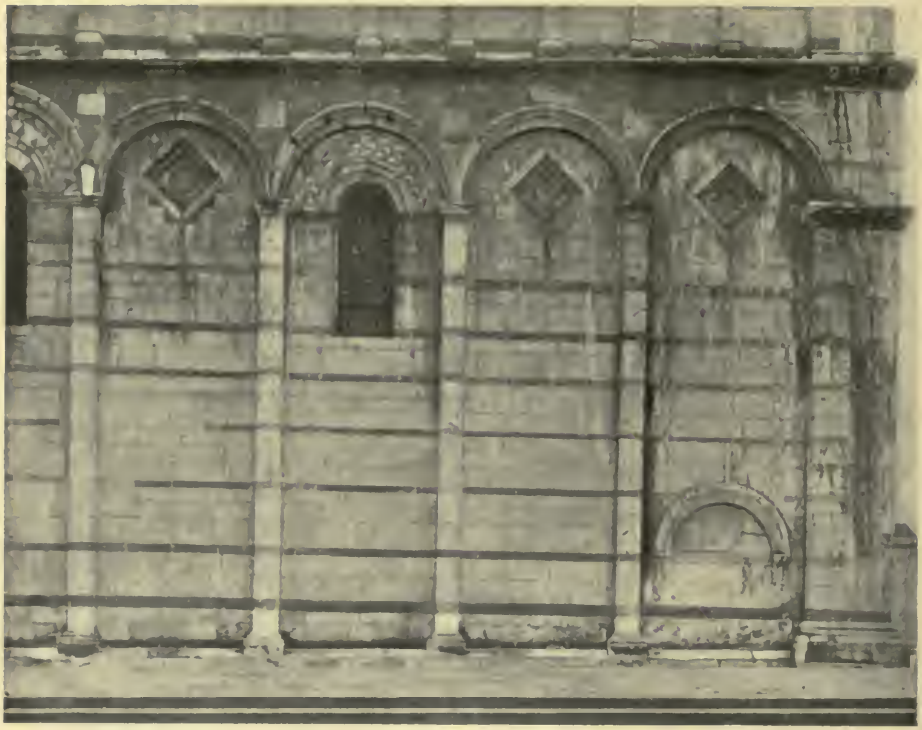


FIG. 9.—PISA CATHEDRAL NORTH WALL AND LEANING FACADE.

Showing masonry construction of the downward bend of the stripes and arcades, rising line of the string-course and oblique cutting of blocks below and above the string-course.

For the south wall similar facts are apparent in the masonry details. In the detail, Fig. 8, we can see the cutting of individual blocks just below the string-course. Above the string-course the contrasting direction of the black stripes, as compared with it, is very clearly seen.

Thus construction is proven for the leaning second story of the façade by relating the masonry of the side walls to that of the corner pilasters.

Is there any one so perverse as to suppose that the given façade gallery leans by construction because the first story leans by accident; i. e. that the builders, from intention or indifference, continued a lean in construction which had first arisen from accident? If settlement occurred, it was corrected by a return to the perpendicular in the three upper stories, why then should it not have been corrected at the second story?

Probably our proof for the second story (the first gallery) will be allowed to cover the lower façade; but we have for this lower fa-

FIG. 10.—SURVEY OF THE SOUTH WALL, PISA CATHEDRAL.

This survey is shown also in two enlarged sections, Figs. 13 and 13A.

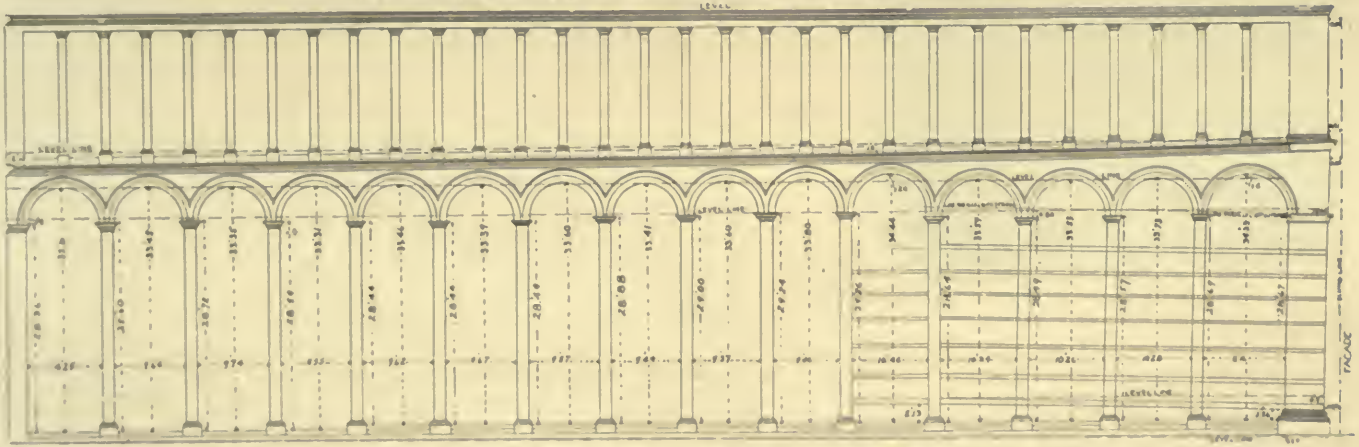


FIG. 11.—SURVEY OF THE NORTH WALL, PISA CATHEDRAL.

There are no surveys for the curve of the roof-line on the north wall, for which see photograph, Fig. 7.

FIG. 12.—SOUTH WALL, PISA CATHEDRAL.
Showing the oblique string-course.

çade such remarkable proofs in the way of measurements that we cannot resist the temptation to produce them.

Hence the surveys of the north and south walls, from the façade to the fifth bay inclusive. Figs. 13 and 14.

For the south wall consult, in Fig. 13, the measures as taken between the plinth and the lowest black masonry stripe. They are found to be at the fifth bay 2.37, and at the angle 1.25.

On the theory of settlement the sinking was therefore 2.37 — 1.25 = 1.12 (feet and decimals) between the fifth bay and the façade, for the masonry courses above the plinth line. By consulting the photographs, Figs. 6 and 8, it appears that the masonry courses continue to run in parallel lines up to the capitals.

We will now ascertain the amount of settlement of the pilaster capitals (Fig. 13). Beginning with the farther pilaster of the fifth bay and comparing its height with that of the corner pilaster we have a contrast of 31.04 and 28.32. Thus the settlement of the building on this line must have been 31.04 — 28.32 = 2.72. We have, therefore, the absurd result that the capitals settled 1.60 ; or *nineteen inches*; more than the masonry courses just under them.

We will next compare the measures for the arches, Fig. 13. The fifth arcade is 35.57 above the plinth, and the arcade next the corner pilaster is 33.98 above the plinth. Thus the settlement of the arcades would be 35.57 — 33.98 = 1.59. Consequently they must have settled 1.13 *less* than the capitals directly under them; all of which is absurd.

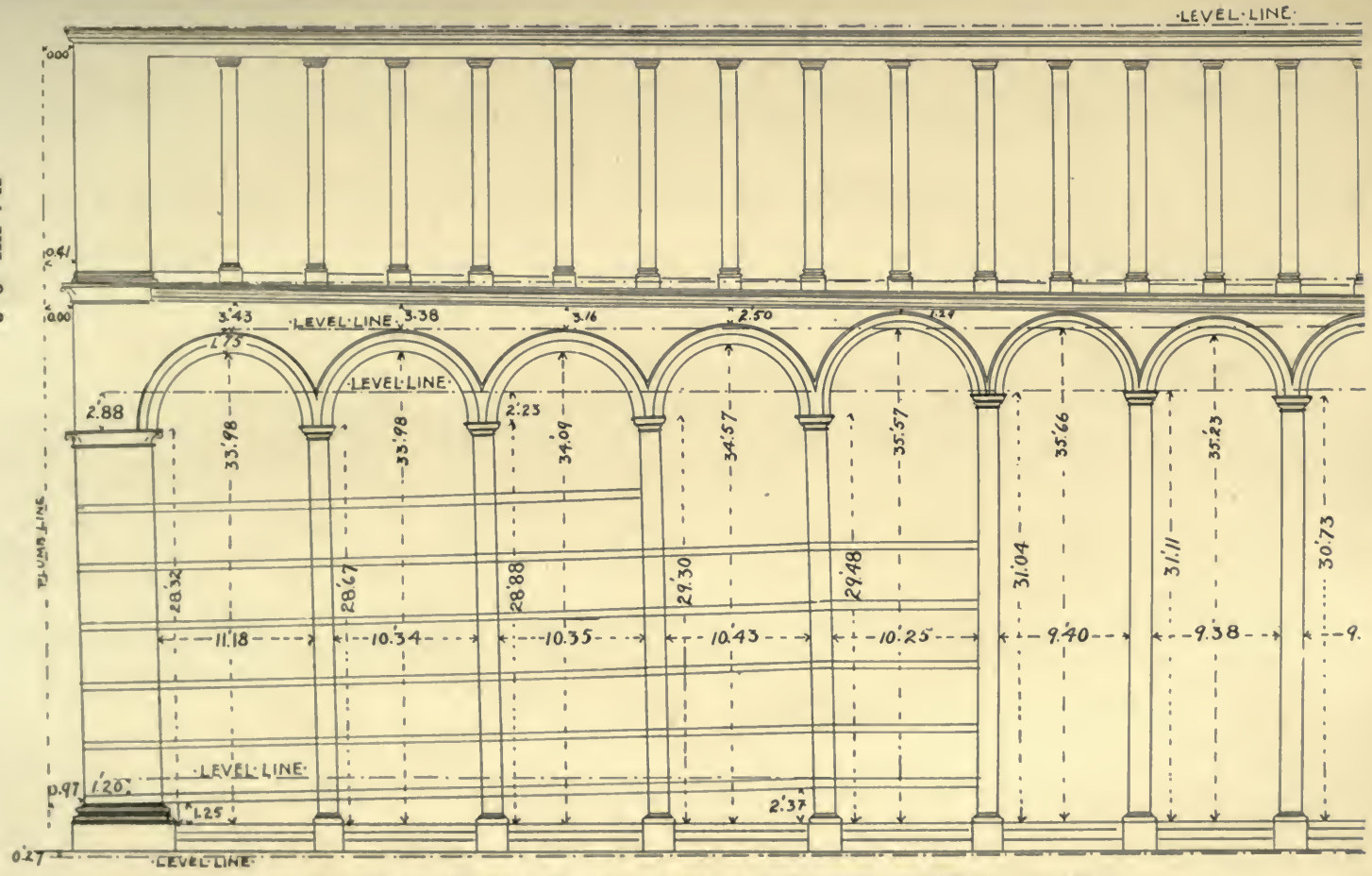


FIG. 13.—SURVEY OF THE SOUTH WALL, NEAR THE LEANING FACADE, PISA CATHEDRAL.

Enlargement of Fig. 10. Fig. 13A continues this section.

FIG. 13A.—SECTION OF THE SOUTH WALL, ADJOINING THE TRANSEPT PISA CATHEDRAL.

Enlargement from Fig. 10 and connecting with Fig. 13. A remarkable feature shown here is the drop towards the transept of the pilaster capitals, while the arches follow the string-course. Compare Fig. 13.

We will repeat the measures for the five bays next the façade on the south wall and leave the quicksand experts to struggle with them.

The masonry courses settled 1.12.

The pilaster caps settled 2.72.

The arcades settled 1.59.

If there was a settlement.

And if there was one, the string-course rose six inches in the same five bays just afterward; and after that the upper corner pilaster settled again, and all the adjacent masonry courses settled with it, for eight bays above the string-course. (See Fig. 6.) This amounts to saying, not only that there were quicksands at Pisa, but that the masonry of Pisa was a combination of putty and India-rubber as long as the building was going up, and that it grew to be like other stone directly afterward.

We will now apply similar tests to the theory of settlement for the first five bays of the north wall (Fig. 14). As measured to the plinth the first black masonry course gives 2.13 at the fifth bay, and 1.36 at the angle. Above this line the masonry courses are parallel, and they must have settled (if at all) .77 up to a point just under the capitals (2.13 — 1.36 = .77).

If we next compare the heights of the pilaster capitals, we find them *rising* .18 between the fourth pilaster and the angle (28.67 — 28.49 = .18). On the other hand, the last three arcades rise .70 (34.23 — 33.53 = .70). These facts cannot be reconciled with a forward lean of one foot (exactly .97) of the corner pilaster, as due to a settlement which began at the fifth bay, and it must have begun there, if anywhere.

The expert is now invited to re-examine the masonry of the north wall, as shown by photographs, Figs. 7 and 9, and to draw his own conclusions, without assistance either of argument or of ridicule.

Some interesting results are obtained by applying the measurements obtained at the angles to the details of the façade itself. See Fig. 4. As measured to the pavement, the right (S. W.) pilaster corner capital is .35 lower than the left (N. W.) corner capital. This appears by comparing the height at the angle of the pilaster capitals in the surveys (Figs. 13, 14). This variation is connected with a gradual drop in the line of capitals from left to right, as the photograph, Fig. 4, shows. But the cornice above, as measured to the pavement *rises* .30 from right to left. This appears by comparing the levels for pavement and string-course, as given on the ground-plan, Fig. 5 (.86 — .56 = .30). Therefore, the distance between string-course and pilaster capital on the right (S. W.) angle (Fig. 4) is .65 greater than the corresponding measure at the left (N. W.) angle.

It follows from the above measurements, if the theory of settle-

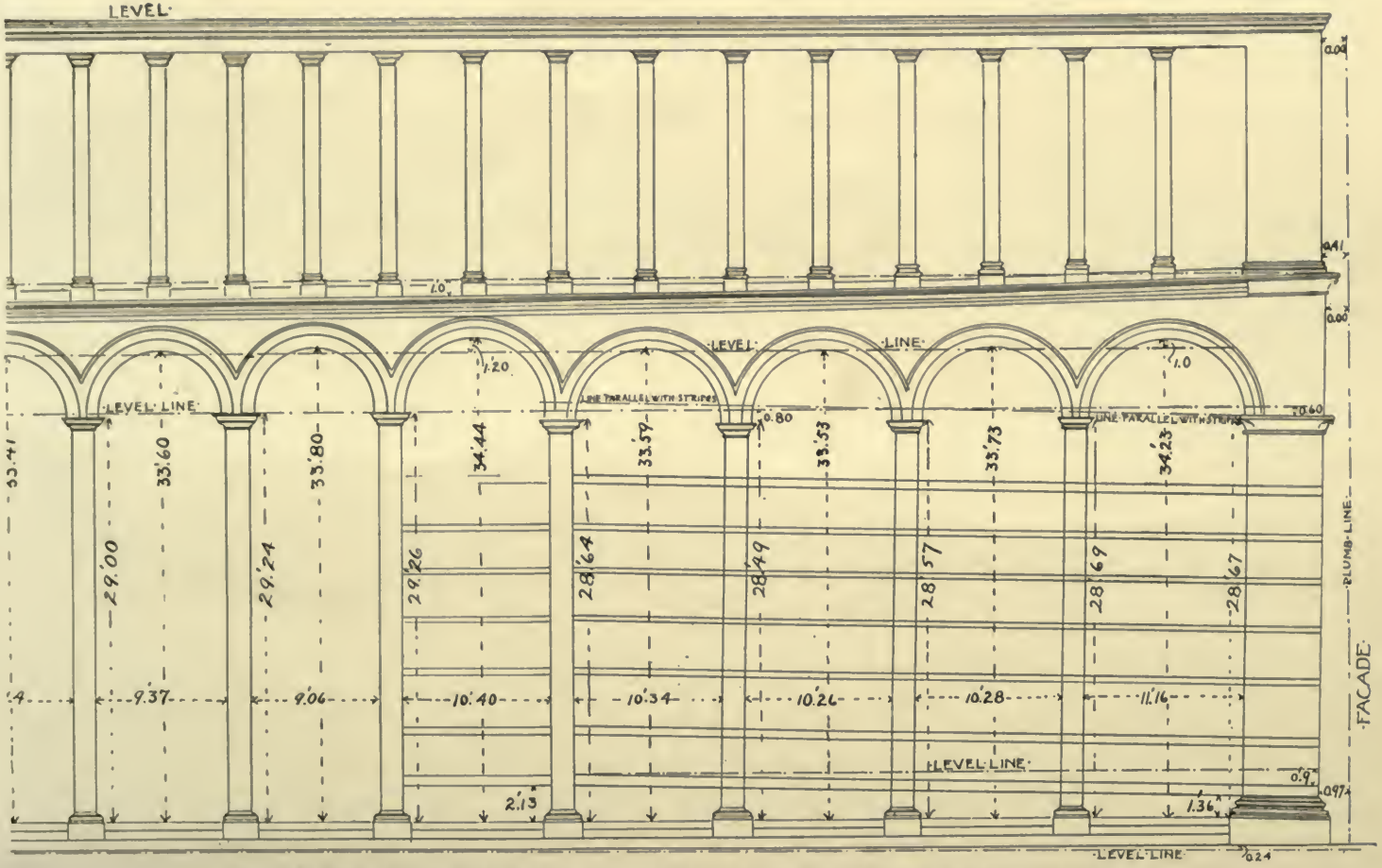


FIG. 14.—SURVEY OF THE NORTH WALL, NEAR THE LEANING FACADE, PISA CATHEDRAL.

ment be applied to them, that the first story of the façade had two lateral settlements in opposite directions, besides the forward settlements. If the measurements are taken to the capitals it settled one way .35, and if measurements are taken to the string-course, as compared with the capitals, it settled the other way .30, but not enough to bring the string-course level.

Finally, when the levels are taken on the first exterior gallery and on the interior gallery, which corresponds to it, it turns out that the façade settled laterally in opposite directions *at one and the same place* .24 in each direction. Mr. McKecknie is authority for these levels, which were taken with a very fine instrument, and they are supported by measures for the heights of the interior galleries which have been made to the pavement.

If one could fancy the Pisa Cathedral a ship at sea, these sideway rollings, and back and forth pitchings would be comprehensible. On dry land they have no parallel.

It would be a pity, however, to overlook the positive results which the measurements of this essay offer, aside from the light which they throw on the supposed yielding of foundations at Pisa. As contributions to the study of constructive asymmetry (see Vol. VI., No. 3), they are invaluable. Once more it may be said that S. Mark's at Venice offers the best parallel to the Pisa Cathedral, but in S. Mark's, owing to the roughness of workmanship, it is impossible in details of this kind to draw the line between such natural irregularities of hand-work as appear in old lace and in Oriental rugs, and intentional construction.* At Pisa the proofs of intention are definite. The term "symmetrophobia" may be fairly applied to these variations, and from this standpoint also, as distinct from debates as to foundations, geological formations, and earthquakes, some light, it seems to me, is thrown on the problem of the Leaning Tower. The Tower is wholly Pisanesque. If nature did it, it only did what human nature had already done at Pisa, and the Pisa Tower would only prove to be an accident that has a thousand intentional counterparts in the Cathedral. At Pisa culminated that remarkable amalgamation of Greco-Byzantine subtlety and mediaeval exaltation which, for centuries to come, may still puzzle and astound the weaklings and trucklers of later and decadent generations.

Attention is called to the wave lines of the pilaster capitals on the north and south walls, Figs. 10, 11. They lead us back to the problem and purpose of the curves considered in Vol. VI., No. 4. Remarkable counterparts are found at Santa Maria del Giudici near Lucca; remarkable, not in the sense that such wave lines are not found elsewhere; but remarkable in the sense that the modern sceptic has

*This remark is also made in the last article on the score of the interior masonry stripings of the Pisa Cathedral as compared with the irregularities of casing in S. Mark's.

a harder task than usual to scoff down the proofs of constructive intention. Photographs and surveys for the wave-lines at Santa Maria del Giudici are in the possession of the Survey.

Aside from the minor wave line the expert is requested to examine the great curve of the pilaster caps. on the south wall. The measures are best seen in Figs. 13, 13A. The curve (or bend) is best seen in Fig 10. The measures show the highest cap. (the seventh from the façade cap. inclusive) to be 2.79 higher than the façade cap. and 2.92 higher than the transept cap., and yet the arcades hug the string-course as far as the transept. Strange to say, this enormous bend of nearly three feet deflection wholly escapes detection in the total effect of the south wall. I was first made aware of it by the measures. One easily sees the drop at the façade, but in the direction of the transept it wholly disappears in the deceptive effect of the arcades.

It is evident from the measurements which have been offered that all question and doubts raised by later repairs of masonry disappear when these measures are considered in mass. As a matter of fact the plinth line of the Cathedral is new masonry throughout, excepting at the north-west angle (Fig. 9), and repairs for a foot or so above this line are quite general all around the building. There is a great deal of fresh masonry in the fifth bay on the south wall, and above this line there is occasional repair, but not much, in other quarters. The Survey possesses a series of photographs in 8 x 10 size and corresponding to the sections shown in Figs 8 and 9, which show the individual masonry blocks all around the building. It is easy to specify the repair blocks on these photographs by the freshness of surface and by the lack of weathering and discoloration. The method has been followed in these repairs by inserting fresh blocks as needed in each special instance, of size or height corresponding to those which have been removed. The Survey was also careful to take the actual surface levels on all sides of the building as well as the measures which were made to the plinth line. These levels are entered in detail on the ground-plan (Fig. 5) and are there connected with a summary for the levels of the oblique string-courses. The actual surface levels are also entered on the surveys for the north and south walls respectively. These remarks bear on the general attention which was given by the Survey to accurate detail.

Should the question be asked as to the motive of bending down the masonry stripes at the fifth bay from the façade, the answer is, probably, that the lean of the façade would have been more easily detected if the stripes did not enter its corner pilasters in rectangular blocks. In such a case every block of the façade would have been necessarily cut obliquely, and in angles which would attract every eye. Thus the lean would be instantly detected. At present it generally escapes notice. In the "Seven Lamps" the lean of the façade was noticed by Mr. Ruskin and is there attributed to settlement, but I am not acquainted with any other publication which mentions it. The fact was unknown, for instance, to a high architectural authority in Pisa, with whom I had the pleasure of conversing in 1895, and who was officially connected with the public monuments.

The bent stripes are more easily noticed, but the logic which connects them with the façade, in one proof for the constructive purpose

FIG. 15.—THE PISA CATHEDRAL.

From a point of view illustrating deceptive perspective results of the sloping string-courses.

of both, has hitherto escaped the perception of the lynx-eyed nineteenth century. Here again Mr. Ruskin has ascribed the distortion to a settlement of the façade. The bent stripes are themselves more generally overlooked than the photographs would lead one to suppose. They have their counterparts in the galleries of the Pisa Cathedral (Vol. VI., No. 3, Figs. 6, 7); in the clerestory cornices at Cremona (Vol. VI., No. 4, p. 502), and in the outer masonry of S. Alessandro at Lucca (for which the Survey has a photograph and a drawing, unpublished). They are, in my opinion, connected with the system of curves and bends treated at length in Vol. VI., Nos. 3 and 4, but have also here the special purpose of avoiding an instantaneous detection of the leaning facade, which would otherwise result from the use of striped masonry.

As for the oblique string-courses of the north and south walls of the Pisa Cathedral, which are, as described, each two feet out of horizontal, I have supposed them to have the purpose of building in perspective; for points of view similar to that of Fig. 15. Compare Vol. VI., No. 2. It must not be forgotten that there are slight obliquities in the corresponding lines of the transept string-courses, which drop to meet the side string-courses (see entries, Fig. 5); and this also suggests a perspective purpose. That certain perspective tricks were employed at Pisa in other buildings, and also otherwise in the Cathedral, is incontestable. I am, however, of the opinion that all such deflections produce an effect of optical mystification and of "life" independent of any direct effect of increased magnitude. If we admit a general fondness for obliquities and a general hatred for parallels

to have been common at Pisa, these string-courses lead us back once more to the problem of the Tower, and may be only another illustration of the spirit which prompted its method, if not its eccentric exaggeration.

The oblique string-courses are very generally overlooked by visitors to Pisa, as the eye tends to discount them from all points of view into the natural effects of another point of view. During my last stay in Pisa a very high French authority on Italian art consulted me on the point as to whether such an obliquity actually existed or whether he imagined it, which shows that it is not very conspicuous.

Another interesting feature of the north and south walls is the departure of the lines of arcades from the lines of the string-courses at the fifth bay. This is doubtless one more mystification, intended to avoid and break down the too obvious appearance of a rising obliquity. This mystification certainly had its effect on Mr. Ruskin, for in the "Seven Lamps" we find him stating his doubt, in facing the fifth bay of the south wall, *whether* the arcades fall or the string-course rises. The facts are that the arcades fall over a foot and a half, and that the string-course goes up six inches in the given five bays. On the north side it goes up a foot. See Fig. 14, where the measurement to a level is entered for this point.

In an earlier article we have presented the facts regarding the variations of arcade spacings on the given walls, and the proofs of constructive intention. These arcade spacings are entered on surveys 10, 11. On both walls the spacings diminish about two feet between the first and sixth bays. Finally, we shall not forget the curve in plan of the south wall. The survey of the curve is given in Fig. 5. A photograph of it was published in Fig. 6, Vol. VI., No. 4. The curves of the north wall have not been previously illustrated. Two of these curves are convex in plan, and begin at the second story (Fig. 4). Hence they are potentially open to the suspicion of thrust, and they were therefore omitted from my article on horizontal curves. The curves in elevation of the north wall are seen in the string-course and cornice in Fig. 7. These curves are in opposing directions, but the effect of a curve in elevation, which appears in the roof line, is partly due to an effect of the curve in plan, which is seen in Fig. 4.

As a final point regarding all preceding measurement it will be remembered that I have proven in Vol. VI., No. 3, that the limit of error due to carelessness of the Cathedral masons can be stated as between eleven-hundredths and three-hundredths of a foot. Consult the arcade spacings of the transepts in Fig. 5, which tally within these limits.

FIG. 16.—NORTHWEST ANGLE OF S. MARK'S, VENICE.
Showing a delicate forward lean and return bend.

IV.

It will probably be conceded, after the publication of this Paper, that the Pisa Cathedral façade leans by construction. Once more: What may have been the purpose?

Possibly the bend or curve should be considered as the essential fact rather than the lean. From this point of view we find a constructive tendency which is sympathetic with the use of vertical curves, bends and leans in interiors. (Vol. VII., No. 1.) There are no straight vertical lines on the exterior of S. Mark's at Venice, excepting at the southwest angle, where the recent restoration has been

FIG. 17.—PORTION OF S. MARK'S FACADE, IN PROFILE.

By sighting from foot of the picture the lower columns are seen to show a forward lean. The front column leans outward 1¾ inches.

made. Aside from restorations, the vertical lines of the exterior of the lower main façade are, to my observation, all delicate forward leans, with a return above to the perpendicular. This appears, for instance, at the unrestored northwest angle, Fig. 16. The lower columns along the main front, aside from restorations, all appear to lean forward slightly. For instance, the front left column in Fig. 17 leans forward 1¾ inches in a height of eight or nine feet. The columns above are either brought back to the perpendicular or leaned slightly backward. This can be seen in Fig. 17 for the farthest columns, by holding the bottom of the picture to the eye and sighting down the page. I have also noticed this disposition of upper and lower columns on the choir of the Troja Cathedral.

It is difficult to pin down the sceptic by a conclusive demonstration in every one of these cases, but having pinned him down at Pisa as to the façade, I take the liberty of saying that possibly the system of vertical curves or of forward leans and return bends, was a fre-

FIG. 18.—PISA CATHEDRAL.

Showing a forward lean of fifteen inches and return bend in the profile of the choir. (The levels of the string-course for the whole circumference of the building are entered on Fig. 5.)

FIG. 19.—FACADE OF S. MICHELE, PAVIA.
The whole façade leans out about a foot, with return bend.

quent one in Italo-Byzantine art. On this head witness the following facts:

Mr. Heins, of Heins and LaFarge, has shown me among his photographs an indubitable case of constructed vertical exterior curves (without lean) at the angles of the choir of the Cathedral at Verona.

The choir of the Pisa Cathedral has an outward lean of fifteen inches with a return bend to the perpendicular Fig. 18). The amount of this lean, as revealed to me by plumbing from the upper gallery, with careful reference to discounting differences in the projections of cornices and base mouldings, was an entire surprise. It had escaped the notice of our party of three during four weeks' work

on the Cathedral. This plumb was taken after Mr. McKecknie left Pisa and the announcement of results was an entire surprise also to him.

It subsequently turned out that our own photographs included this fact. Fig. 18 shows this lean and return bend, but not very successfully, as the picture was not taken for the purpose and therefore does not give the details sufficient magnitude. There are absolutely no partings or cracks in the adjacent masonry, and these would have been inevitable in case of accidental settlement.

We may, for the moment, best continue to debate the purpose of the leaning façade at Pisa, by stating additional facts for other buildings. The façade of S. Michele at Pavia offers a fine instance of the forward lean and return curve. Our picture (Fig. 19) showing this façade does not illustrate the facts, and I have explained in the last Paper that no Survey photographs were taken at Pavia. By plumb from the lower window on the centre of the façade the lean of the walls was found to be six inches up to that height. The lean is continuous and uniform for all piers and wall surfaces. The whole front is about two and a half times higher than the point from which the plumb was taken. The front continues to lean above this point, gradually curving back toward the perpendicular, and the whole lean was estimated at eleven or twelve inches. There are no repairs to speak of on the façade, and the directly adjacent side walls are all ancient masonry without breaks. Here partings and cracks would have been apparent if the façade had settled, but it seems incredible that a façade should settle in a curve which bends back to the perpendicular, for no thrust could extend to the piers at the angles. Fig. 20 shows the cutting *of one block* in the right doorway of the façade. A similar cutting at the joints of blocks was noticed elsewhere on this façade.

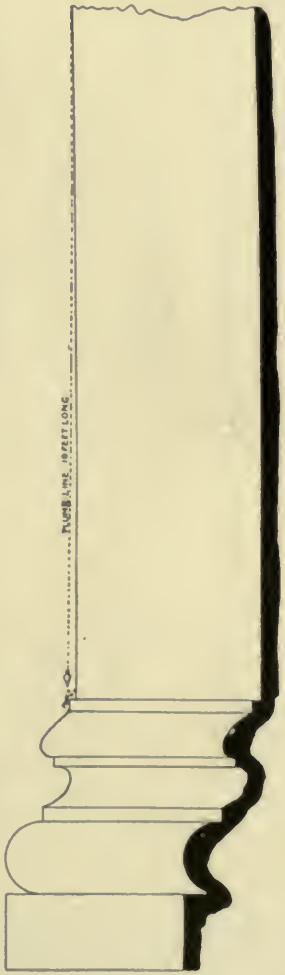


Fig. 20.—Block cut to a lean in the right portal of the façade of S. Michele, Pavia.

The façade of S. Ambrogio at Milan, Fig. 21, leans out nine inches.

FIG. 21.—FACADE OF S. AMBROGIO, MILAN.

The façade leans forward about eighteen inches, with return bend, according to memory.

by plumb to the base of the first gallery. No plumb was taken above this point. The lean continues with a return bend (my notes add that the record for the bend is *from memory*). The whole façade is about two and a half times as high as the gallery plumbed and the entire lean will be about eighteen inches.

It appeared to me here that the masonry might have moved slightly in the upper story to exaggerate the constructive lean, but the lower story is tied in by cloister arcades of the same age as the church.

Counterparts of such bends have been noticed hastily in Ss. Giovanni e Paolo at Bologna and in S. Agostino at Cremona.

The façade of the Cathedral of Ferrara, Fig. 22, has a most pronounced forward lean, apparently without bending back. No other case without the return bend is known to me. By sighting on a cord held in the hand the lean was estimated by Mr. McKecknie at nine inches, but comparison of our photograph with other and better known measurements would suggest that this estimate is too low. As the photograph shows, there are no cracks in the side masonry, which appeared to me wholly ancient.

The leaning façade of the Volterra Cathedral may be a dubious

FIG. 22.—THE LEANING FACADE OF FERRARA.

FIG. 23.—THE LEANING TOWERS OF BOLOGNA.

case. One side wall has undoubtedly yielded here and although there are no signs of settlement for the front, the side wall makes one suspicious. This church was, however, begun by Niccolo Pisano, which again tends to make one credulous. For the buildings ascribed to Pisan architects, when employed away from home, invariably show some of the peculiarities which have been usually ascribed to earthquakes, quicksands and other natural forces at Pisa. This holds at Volterra, as it does at Prato, Orvieto and Siena. Movement of the masonry appears probable in the façade of S. Pierino at Pisa, and of S. Simone Juda at Lucca.

V.

So far it might appear, and especially from the exterior of S. Mark's, that the vertical bends of façades are to be understood from the point of view which has already been suggested for the horizontal curves, and for the entasis, as more elastic and vital, less formal, and less rigid than straight lines. In other words, the bend and not the

lean would be the vital fact, especially as a receding bend, back of the perpendicular, would be clearly an artistically weakening and disagreeable resort for the effect of a façade.

Another, or an additional, explanation is suggested by the purpose which led Michael Angelo to build in a forward lean to the rear wall of the Sistine Chapel before undertaking the Last Judgment. The fact, not the purpose, is mentioned by Vasari, but this purpose was obviously to present the painting to the eye on one plane and without foreshortening of the upper figures. From this point of view the bending back to the perpendicular in mediaeval façades would be for the sake of stability, but the effort would be to present the façade to the eye as far as deemed safe, without foreshortening.

In such construction there must be also an illusion of greater magnitude. In the gallery colonnades of the Pisa façade, for instance, the eye will be accustomed to a given amount of foreshortening for a given height and in so far as this effect is counteracted by a forward lean the eye will conceive greater magnitude for the columns than is the fact.

Those who have studied the wonderful details of the animal carvings which decorate the cornices of the Pisa façade will understand the possibility of a wish to have them seen without foreshortening. The same point of view might hold for the carvings of S. Michele at Pavia (Fig. 19), and for the details of the façade of Ferrara (Fig. 22), but cannot be conceived for the façade of S. Ambrogio.

On the whole, according to my observation, the leaning of façades will have been a comparatively rare occurrence in Italian mediaeval art, and there is no doubt that the Pisa façade is the one which offers altogether the most remarkable illustration of delicate and careful construction, as well as the most thoroughly convincing proof of purpose, whatever that purpose may have been. It is important to remember that constructed leaning faces, including intentional outward leans, have been found in ancient Greek construction by Penrose.

Vitruvius directs that the entire temple façade shall have a forward lean, but no ancient example of the construction has survived.

VI.

The proposition has already been advanced that the Leaning Tower is the work of an age, whose men of genius were more apt to express their eccentricities or daring qualities in architecture than in literature. Given such instances of caprice as we find in the bent column of Arezzo (Vol. VII., No. 1) or in the corkscrew-shaped spire of Gelnhausen, near Frankfort-on-the-Main, and given additionally a habit of building inconspicuous leans, like that of the Pisa Cathedral

FIG. 24.—TORRE DEL PUBBLICO, RAVENNA.

Leans on two sides and is built with a batter on both leaning sides.

façade, for subtle and aesthetic purposes; it is then evident how the Leaning Tower of Pisa may have originated. To this suggestion we can add the corroboration that constructed leaning towers actually were built in other cases.

Those at Bologna are generally conceded to have been constructive (Fig. 23), although Murray's guide book ridicules this theory. Baedeker says of the Garisenda, which is 163 feet high and 10 feet out of perpendicular, that "it is probably one of the few leaning towers in Italy whose obliquity has been intentional." It is of this tower that Goethe says in his "Italian Journey:" "I explain this folly to myself as follows—In the time of civic tumults every great building was a fortress for which every powerful family raised a tower.

FIG. 25.—TOWER OF S. NICCOLA, AT PISA.

This tower has a delicate continuous curve toward the perpendicular; not well illustrated by the picture.

Gradually this tower building became an affair of honor and of pleasure. Every one wished to boast of a tower, and when finally the upright towers became too commonplace the leaning ones were built. And both architect and owner reached their aim. We overlook the multitude of upright towers and seek out the leaning ones." This idea gains force when we recall the report of the mediaeval Benjamin of Tudela that there were 10,000 towers in Pisa. This report is accredited by conservative modern authors. The little village of San Gimignano, near Siena, still boasts thirteen towers.

The Torre del Pubblico at Ravenna is an instance which has probably not previously been noted by any publication as a constructed

FIG. 26.—VIEW OF THE LEANING BAPTISTERY OF PISA.

leaning tower. It is built on both the leaning sides with a batter, and the brick masonry is all manifestly of one date and of homogeneous construction. This batter appears in a photograph which was purchased in Ravenna and has been slightly emphasized in a drawing made from the photograph by Mr. McKecknie, who has not seen the original (Fig. 24.) This batter must contemplate a reinforcement on the side of the lean, belonging to the original construction, and seems to make out a clear case of intention.

Fig. 27. Detail to show the base courses of the Pisa Baptistery. The levels of Fig. 28 were taken at the plinth blocks.

VII.

It has been observed that the Leaning Tower of the Pisa Cathedral curves towards the perpendicular and that this probably suggested the story of a settlement and subsequent attempt at rectification, which has found credence with various writers since the time of Vasari. But there is another bell tower in Pisa, that of S. Niccola, which was built by Niccolo Pisano, which also leans *and which also curves* toward the perpendicular. This tower now stands in such contact with other buildings that no conclusions can be drawn ex-

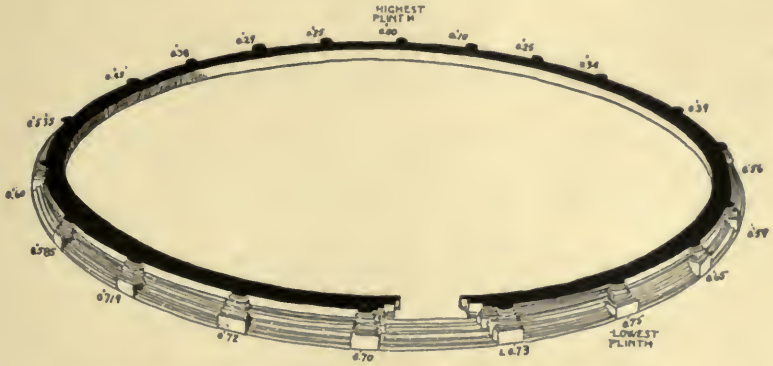


FIG. 28.—LEVELS OF THE BASE COURSES, PISA BAPTISTERY.
They tilt downward nine inches in the general direction of the lean.

cept from the curve. Our Survey omitted to take a photograph of this tower, owing to haste and want of time after finishing other surveys, but I have found a photograph among the pictures owned by Messrs. Heins and La Farge in which the curve appears. As its existence in the building is attested by the eyesight of three observers it has been thought best to reproduce the photograph, Fig. 25, although in the published dimensions the picture is only available as calling attention to a fact which has been attested by observations of the original building.

There are no theories of quicksand experts or of engineers to explain why a completed tower should settle in a curve bending from the base toward the perpendicular, and it is not likely that the remarkable explanation suggested by Murray for *the* Leaning Tower ever had its counterpart in another building. Moreover, the curve of this tower is delicate and continuous, and is not produced by a successive straightening up of different stories of columns as in the Cathedral Campanile.

VIII.

That the Baptistery of Pisa leans is not generally known. There is an art dealer of much intelligence in Pisa whose establishment is at the corner of the Via S. Maria and the Piazza del Duomo. He spends much of his leisure time on the corner, looking over towards the Baptistery, but he was much astonished when I showed him this lean, and it would thus appear that it is not generally known in Pisa. Fig. 26 shows the facts as they are seen from this corner, but it must not be forgotten that the forward lean of the Cathedral façade tends to accent and exaggerate the lean of the Baptistery. A rough calculation goes to show that this obliquity amounts to about seventeen inches.

I will now submit the survey for the levels of the base courses of the Pisa Baptistery, Fig. 28. How these base courses are actually arranged does not clearly appear from the drawing which gives the levels.

Hence the drawing (Fig. 27) for the lower masonry courses. Here it appears that the height of the plinth blocks at which the levels are taken represents the height of three courses of masonry above the pavement and below the profiled moldings.

If the builders of the Baptistery had wished it to lean they would probably have laid out the kind of foundation which the levels of the plinth blocks *prove that they actually did lay out.* These foundations tilt downward evenly and gradually exactly nine inches (.75) in the direction of the actual lean.

It would be a tenable idea that the Pisa Baptistery (begun 1153); as contrasted with the Tower (begun 1174); represents an adherence to the subtler methods found in the choir and in the façade of the Cathedral. It would be impossible to resist the conclusion, if this inconspicuous lean of an entire round building be admitted as constructive, that we have in such leans one more illustration of a subtle dislike for mathematical formulas, of a wish to give a subtle variety and interest to the building.

It is difficult to resist the conclusion that the Leaning Tower is the work of bold and daring artists adopting, in their own aggressive spirit, methods which had long been practiced in less conspicuous ways.

Wm. H. Goodyear.

THE NEW LIBRARY OF CONGRESS:

A STUDY IN DECORATIVE ARCHITECTURE.

THE new building of the Congressional Library draws such crowds of visitors that the cause of this popular interest is well worth seeking. Month after month, all through the Spring of 1897, this absolutely naked building, without even a seat in it, except in the rotunda, and without a table, a book-case, a single book or portable work of art on exhibition has drawn visitors in crowds. The officers of the Watch in the building tell you that the average is fifteen hundred visitors a day, but it might well be greater than that and not surprise one who has noted the ingress and egress of the sight-seers. It is certain that the handbook which has been published by Messrs. Curtis and Cameron, of Boston, has been a very successful undertaking, very large editions of it having been sold. The photographs of the building also sell very largely; not only Mr. L. C. Handy's excellent and cheap pictures, from which, with one or two exceptions, the illustrations of this article are drawn, but also the admirable "Copley Prints," by Messrs. Curtis and Cameron, the subjects of which are generally the wall paintings which are so numerous and so splendid in this favored structure.

It is undoubtedly true that the edifice, with its adornments, attracts more visitors in its capacity as a National building, and one situated in Washington, where sight-seeing is the order of the day, than it would if a building in private or in state ownership, and if located in one of our commercial cities. Nevertheless, the interest which this great crowd takes in the decoration of the building, its long and curious study of the details and the evident enjoyment which it takes in the novel spectacle of a building really rich and refined in its decorative character, is an inspiring one to any person who hopes for the growth of a living interest in fine art.

The history of the building as a monument is rather complicated. Messrs. Smithmeyer and Pelz were the designers whose plans were accepted, ten years ago. In 1888, General Casey, Chief Engineer of the Army, was put in charge of the work, and Mr. Pelz continued as one of the chief designers. Mr. Bernard R. Green was the engineer in charge at this time and continues still in control of the building. In 1892, Mr. Edward Pearce Casey, son of General Casey, was appointed architect and director of the adornments of the building. The architectural work was far advanced when he undertook it, and much of the ornamental detail of the interior had been designed

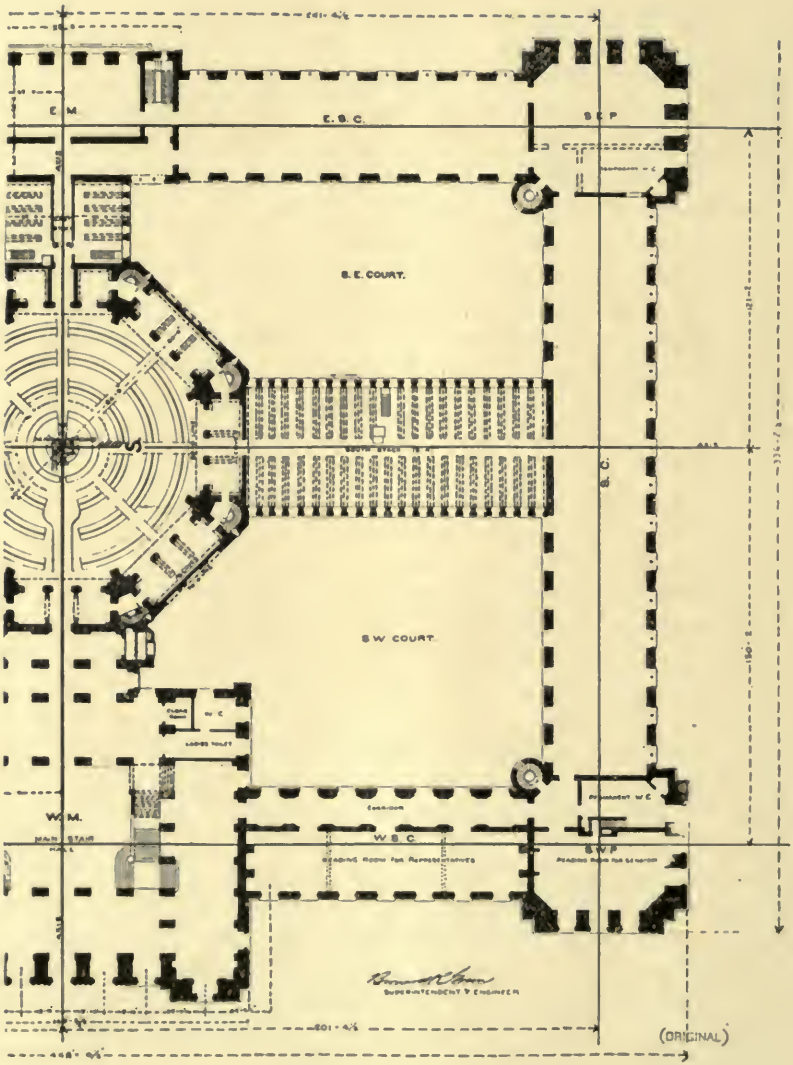


FIG. I.—FIRST FLOOR.

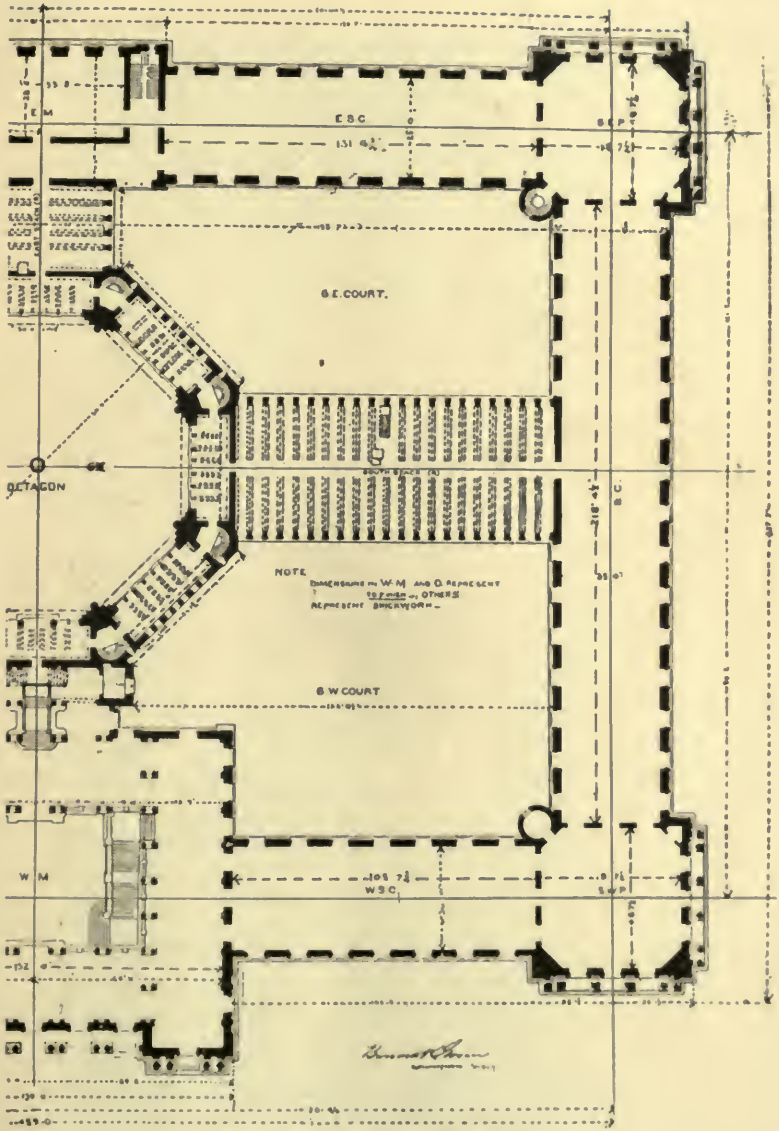


FIG. 2.—SECOND FLOOR.

FIG. 3.—VIEW FROM N. W.

before his advent, even when put in place under his direction. It will be seen, then, that the question as to who designed any given capital, or frieze, or entrance-way may be difficult, and, yet, in each individual case it is not hard to discover, beyond a doubt, whose design a given part of the building embodies. This much, at least, is certain; Mr. Casey has had the chief direction of the ornamentation furnished by the eminent sculptors and painters whose work is, perhaps, the chief attraction to the larger part of the visiting public; while the purely architectural details are more commonly the work of the earlier directors of the undertaking.

The plans of the building, Figures 1 and 2, suffice to show its general arrangement, for the wing not given in each plan is precisely like the one on the opposite side, except that in the first story plan the arrangement of reading-rooms for members of Congress is not repeated in the northern wing. The view of the exterior taken from the northwest, which is given in Figure 3, should be studied in connection with the plans, that one may gain an intimate sense of the arrangement of the whole structure. The plans show how the reading-room occupies the greater part of the central octagon; with alcoves around this for students and also for the reference library; the octagon being 140 feet wide over all, or very little smaller than the British Museum reading-room; although the dome itself, in the American example, is carried on piers far within the perimeter and is brought down to 100 feet. The stack-rooms reach from the octagon to the curtains, on the north, south and east; while on the west there is only space for a double lobby between the octagon and the Entrance Pavilion. The general plan may be considered economical, practical, such as to utilize aright the abundant space allowed the building, but it gives no evidence of being part of a strong architectural conception. The exterior, which results from it, is of no real consequence, except for its detail. It is not, of course, of any great value as a work of art, in its general system or distribution. The dome is not very dignified nor very graceful. The great portico with coupled columns resting on a second basement and adorning a central pavilion is neither very novel nor very impressive considering its size and costliness, and the side pavilions are notably feeble and inconsequent. That false idea of grandeur which consists mainly in hoisting a building up from a reasonable level of the ground, mainly in order to secure for it a monstrous flight of steps which must be surmounted before the main door can be reached, has prevailed here as in other buildings erected by the government. It is not quite so great an offender in this respect as the Capitol, but the same spirit is in it. The curtain walls between the pavilions, with their long rows of uniform windows with their frontons alternating round and pointed is a common property of the conservative architect's office,

and these are neither better nor worse than scores of their congeners in the cities of the Union. There is, however, some architectural appropriateness of general plan and design, a certain fitness of the building for its purposes which, though not visible to the spectator who approaches the building and looks up at it, may yet be guessed at by the comparison of the bird's-eye view with the plan. The courts are very spacious and the walls are not so high proportionally as to shut out light, even from the basement windows. The walls of the courts are everywhere faced with brick, but with granite enough interspersed to lead up properly to the granite superstructure of the great central pavilion and the smaller pavilions as well. That is to say, as it had been decided in advance that the attics of all these pavilions should show walls of granite on their side to correspond with the rest of the exterior, this topping-out with granite is provided for within by the free use of the same material in the lower walls of the court. The stack-rooms, north and south of the great octagon and the small stack-room to the east have very simple fronts on the great courts, the windows arranged in regular vertical rows with scarcely any break between the openings, and these rows alternate with continuous solid piers, the whole forming just the design that should be given to an office building in one of our commercial cities. The sash are all fixed and there are outside galleries for the necessary cleaning of the glass. A certain number of books will be accommodated in the octagon itself, in the alcoves which surround the great reading-room, and the arrangement is such that two millions of volumes can be perfectly well housed in the stack-rooms plus these alcoves. The great rooms in the curtains and those rooms, also large, though not so large, in the four corner pavilions, are mostly left at present for the undetermined purposes of the future. The rooms of the upper story are elaborately adorned, the pavilions with paintings of considerable significance, the curtain galleries with merely decorative coloring. In the first story, also, the rooms and corridors on the west front to the north and to the south of the main stair-hall are both decorated with paintings of importance. All these rooms as here enumerated may be taken as museum-rooms—as exhibition rooms—as rooms in which the artistic and historical treasures of the Library may be exposed, and those not named above, that is to say, the greater number of the large halls in the first story may be taken as appropriated for special libraries and for general work of cataloguing books, packing, binding and the rest of the private business of a great library. It is evident, however, that there is vastly more room in these halls than is likely to be required for all these purposes taken together. After all the services of a vast public library have been provided for in the first floor and the basement, and after all the conceivable needs of exhibition room

shall have been filled, there will still remain a great deal of space which for generations to come may look in vain for a proper use. It is, therefore, entirely reasonable, what the managers of the building tell the visitor—namely, that while the present stacks will hold two millions of volumes, a not radical change in the building will provide fully as much space in addition. Now, it may be interesting to note that accommodations for four millions of volumes would just about house the greatest library in the world—namely, the National Library at Paris; for this great establishment is put down as holding about two million and a half of bound volumes with, perhaps, a million pamphlets and the like, and some twenty thousand portfolios and folio books in the department of prints. That great library possesses also collections of MSS. and of coins and medals and other antique treasures of art which the Library of Congress can never hope to include among its possessions. The conclusion seems to be that the whole great library of Paris, always excepting those of its possessions which form no part of the library in the strict sense, could be housed in the building now existing in Washington. As for the dimensions of this structure, if any New Yorker is curious to know just how big it is, let him walk around the distributing reservoir, on the site of which the New York Public Library, composed of the Astor, Lenox and Tilden Foundations, is to be erected. The lot of ground on which the reservoir now stands is almost exactly as large as the Library building at Washington, for this latter measures 468 feet in length, outside the first story walls, and 336 feet, 7½ inches in depth.

The exterior of the building is not very richly adorned with sculpture, but there are a few works of importance, such as the reliefs in the spandrels above the three main entrance-doorways. These, which stand for Literature, Science and Art, are the work of Mr. B. L. Pratt, whose work we shall find again in the interior of the building. A reference to Figures 5 and 6 below will aid the reader at this point. In the circular windows within the great colonnade of the entrance pavilion are portrait busts by three different sculptors, Messrs. Herbert Adams, F. W. Ruckstuhl and J. Scott Hartley. Above, in the attic of the Entrance-Pavilion, and where the angles of this large structure are emphasized by secondary pavilions of slight projection, two rounded frontons, having each its tympanum filled with sculpture in high relief, and two vigorously modelled telamones to support it are the work of Mr. William Boyd, who appears also to have modelled the strongly-emphasized band of ornamental sculpture above the portrait busts and behind the Corinthian columns of the central colonnade. All this sculpture is well subordinated to the building, except, perhaps, the broad band of decoration last named, concerning the propriety of which there may

be grave doubts. The very considerable display of enriched capitals, both of columns and pilasters—of festoons around labels and of arabesques above windows, is effective in making the Entrance-Pavilion an enriched and brilliant one instead of the cold pseudo-classic embodiment of formulas which it might so easily have been; but none of this sculpture is of first-rate importance in itself. Much less effective as a part of the building, however interesting in a scientific way, are the "ethnological heads" which are carved upon the key-stones of the lower row of arches. All of this sculpture, together with the bronze doors, tells upon the exterior; and yet the exterior is not a very important piece of decorative architecture; chiefly because no one intelligence has been called in to combine this very considerable amount of valuable material into a common whole. To rightly discuss and criticise this exterior, we should have to lay before our readers at least a dozen photographs of detail because of the importance of this detail in itself; but even then, we should have to end as we begin by the statement that the detail is not so used as to make up with the building proper an important architectural composition. It is a kind of warning of what is to come when it is said, roughly, that the building is rich within and plain without; while yet it has to be said that there is so much detail of some value lavished upon the rather plain outside.

A word must be said about the great double perron and its approaches, for if this rather absurd means of expense and display must be admitted, it is well that it should be made as superb as possible; and it cannot be denied that the great "stoop" in question is very well distributed. The plan, Figure 4, shows the general disposition of this great flight of steps with the carriage-drive which, mounting a slight ascent, passes under the great platform of entrance and allows persons descending from vehicles to enter the front doors of the basement story. Figure 5 gives a general view of this very sumptuous system of approaches, and suggests the magnificent opportunities there are for the placing of statues on the twenty-four pedestals, more or less, which are not occupied by bronze lamp-stands. The Fountain of Neptune, the work of Mr. Hinton Perry, is shown in this view, Figure 5, and Figure 6 shows the same fountain in detail, but with the disadvantage that the water is drawn off. The definite level fixed for the water may be supposed to be about where the frogs are seated, so that the great eel in the foreground will be about half submerged. It is hardly fair to judge this fountain until the water-jets are playing and the bronze figures are seen through the mingled veil of water in mass and in spray. Moreover, according to the description in the handbook, there are still more figures to be put in place.

The building may be entered on the basement floor from which

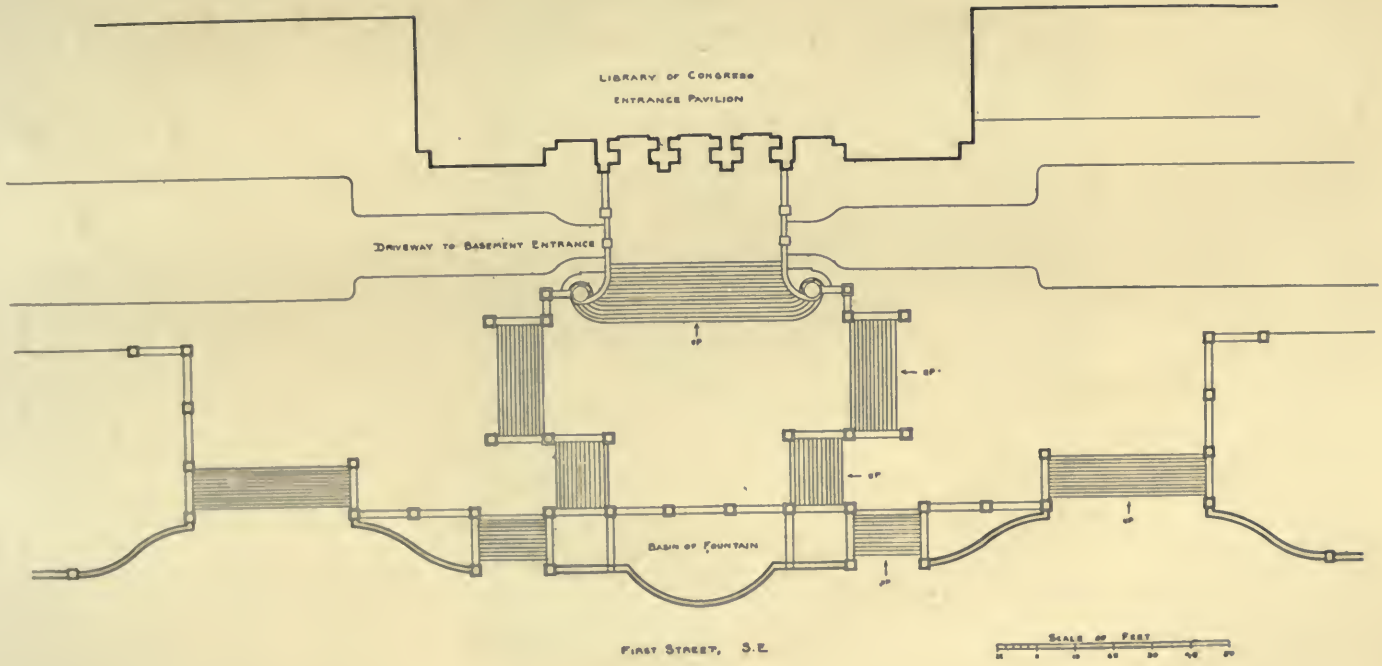

LIBRARY OF CONGRESS
ENTRANCE PAVILION
DRIVEWAY TO BASEMENT ENTRANCE
BASIN OF FOUNTAIN
FIRST STREET, S.E.
SCALE OF FEET

FIG. 4.

a subordinate system of stairs leads to the main stairhall, or it may be entered on the first story through three doorways which are filled by bronze doors of great beauty. The central door, the design of Mr. Macmonnies, has for the general subject of its decoration, the art of printing. The doors of the Northern Entrance are the design of the late Olin Warner, and embody the general idea of Tradition. The doors to the south were also designed by Mr. Warner, but, being unfinished at the time of his death, are in the hands of Mr.

FIG. 5.

Herbert Adams for completion, and are not yet (May, 1897) in place. Passing through either of these doorways, the visitor enters a large vestibule, the decorations of which he hardly notices because of the flood of light which fills the great stair-hall beyond, and because of the elaborate adornments of that hall. Figure 7 shows what the visitor finds in front of him—namely, a view from the center of the main vestibule at the more northern of the two flights of stairs, and some little of the sculptured decoration of the vestibule itself. The figures which adorn the great consoles carrying the girders of the ceiling are modelled by Mr. Herbert Adams. There are two different figures which are repeated in pairs throughout the vestibule. The architectural forms here are not very refined, nor is the general effect very impressive. It will be best, perhaps, to turn away from the great staircase and follow the vestibule itself toward the north;

turning, then, into the more northerly of the two side vestibules which we may as well at once call the Northern Vestibule. Figure 8 represents this vestibule and introduces us at once to the richer adornments of the building. At this point the visitor begins to realize the important fact that he is within the most ornate and, moreover, the most interesting building in the United States. If he is familiar with the monumental structures of Europe he finds himself, now, not unpleasantly reminded of them, and yet what is

FIG. 6.

around him is in no respect a close copy of anything which he remembers abroad. Details, indeed, may be of the well-worn patterns, and the curved arabesques of certain panels as well as the set patterns in parts of the mosaic may seem to him old acquaintances; but the general scheme of adornment is like nothing that he has seen elsewhere. In this Northern Vestibule, for instance, the system of decoration by means of paintings in lunettes above walls faced with marble, treated architecturally with some richness, beneath mosaic-covered vaults, is like nothing elsewhere, simple as the general

FIG. 7.

programme may be. The paintings of the lunettes are by Mr. Charles Sprague Pearce. The vaults above them, which, it is satisfactory to know, are the solid vaults which they appear to be and not plaster shams, are covered with mosaic carried out by Mr. Herman T. Schladermundt, under the general direction of Mr. Casey, and the floors are also laid in mosaic of simple design. The marble work of the walls is all apparently from the designs of Mr. Paul J. Pelz. It has been thought by some persons that the paintings suffer from the strong contrast of color given by the mosaics of the vaults. That is not the impression made upon the present writer; nor was it felt as more than a momentary suspicion by anyone with whom he has discussed the subject in the presence of the paintings themselves. It is not to be forgotten how very powerful is the delicate gradation of representative and expressional painting as compared with the coarser and more abrupt contrasts of color patterns of any sort. Even as, in the exterior of the Palazzo Vecchio, at Florence, the very slender lines of moulding prevail over the bold and rough rustications around them, so a small piece of highly-fin-

ished painting, as of flesh, drapery and landscape, will carry it over almost anything in the way of set patterns in flat or nearly flat color. It will be an extremely valuable experience if a semi-translucent coat of light gray could be passed over the mosaics of one or two of these vaults that we might see whether the paintings would be more perfectly set off by such a diminished intensity of the color

FIG. 8.

system of the mosaic. It is probable that we should see this tinting washed off with satisfaction. As for the paintings themselves, what they have for a general subject is "The Family," and the painting in the large lunette, plainly shown in Figure 8, speaks of the end of the day and the season of repose. On the left of the spectator the

lunettes which are visible represent Labor, Study, and, in the corner, Recreation. The lunette of which only a small piece is visible, on the extreme left, is the one which is most admired by visitors; its special subject is Religion or Worship. These paintings are, it may be noted, in an artistic sense, about midway between the highly conventional and severely restrained compositions of Mr. Vedder and the much freer and more pictorial work of Mr. Alexander and others. In fact, these pictures by Mr. Pearce are very typical of

FIG. 9.

the general character of the mural paintings throughout the building; and, as a consequence, this Northern Vestibule stands well for all of the interior except the great staircase hall.

Passing through the doorway, which shows so brilliantly lighted beneath the lunette "Recreation," one enters the corridor of the West North Curtain; to take the words of the lettering on the plans. The lunettes of this corridor are painted by Mr. Edward Simmons. Their subject is the Nine Muses; and the one plainly visible in Figure 9, at the end of the corridor, is Calliope. It is greatly to be

regretted that we can offer no other and no better view of these interesting pictures. The peculiarity of their composition is, the dominating position held by one large, seated figure; heavily draped and posed in a stately way, while the accessories are severely subordinated. The pictures suffer from the much too pronounced details and

FIG. 10.

the extremely harsh painting and gilding in the vaults above them where a peculiarly disagreeable orange-colored gold is very freely used. The rooms opening out of this corridor are not important in their decoration.

Returning to the main vestibule and passing through it southward, the visitor enters what we will call the Southern Vestibule,

which is represented in Figure 10. The conditions of this part of the building are in all respects similar to those which govern the Northern Vestibule. The paintings in the lunettes are by Mr. H. O. Walker; his general subject is Lyric Poetry, and this general subject is treated in the largest lunette — the one opposite the spectator in Figure 10. The pictures which are unseen in this illustration, but which fill the lunettes on the right or south side, are of such compositions as The Boy of Winander, for Wordsworth; The Dead Adonis, for Shakespeare, and the like. On the left of the illustration are seen the arches which lead to the Main Vestibule—to the southern ramp of the main staircase — and beyond to the stairs leading to the basement story. The reader will observe how, throughout this first story, in all the large vestibules and corridors, there obtains one uniform system of marble-faced walls and piers of the same or nearly the same height, about 12 feet, with vaults springing directly from the level cornice which finishes the wall. This uniformity of treatment greatly enhances the general effect. The Southern Vestibule, in which we are now standing, is one bay longer than the northern one, as the plan will explain. Turning out of it to the right, one enters the long corridor of the West South Curtain, Figure 11. The paintings here are as much bullied by the harsh gilding and the generally unrefined character of the decorations overhead, as are those of Mr. Simmons described above. These pictures are by Mr. Walter McEwen and their general subject is the Greek Heroes. In Figure 11, the lunette at the end of the passage is that of Hercules, and that on the right of the spectator, Jason, who is represented as persuading the young men of the Minyae to sail with him in the Argo. The door at the end of the corridor, beneath "the Hercules lunette," enters a richly-adorned

FIG. 11.

lobby which leads to the Senate Reading-Room. The doors on the right lead to the House Reading-Room, which is the subject of the next illustration, Figure 12. It is not very successful as a piece of combined decoration. The carved tympanums of the doorways are, indeed, very beautiful work by Mr. Herbert Adams; but these hardly affect the general tone of the adornments, in which, of course, color has by far the most important place; for strong color, when

FIG. 12.

present, necessarily predominates and determines the character of the apartment. It seems to have been thought that our representatives in Congress would prefer a room decorated in what used to be called the "steamboat" style; as, indeed, the general character of the room is violent and unrestful. The mantel-piece, at the end of the room, and the corresponding one which forms the subject of Figure 13, are unfortunate in their surroundings. They should receive especial attention. The mosaics which fill the large panels are from the designs of Mr. Frederic Dielman.

Returning through the corridor shown in Figure 11, and crossing the Southern Vestibule, one enters the Eastern Vestibule by crossing a corner of the main stair-hall. This Eastern Vestibule is the subject of Figure 14. The lunettes here are painted by Mr. John W. Alexander, and the general subject is the Evolution of the Book, or, perhaps, the evolution of literature. The lunettes seen in the

FIG. 13.

illustration are the two final ones of the series, having for their special subjects the MS. Book with the Monks at work in the scriptorium and the Printed Book with the master printer looking at proof while the journeyman pulls hard at the lever of the hand-press. The mosaics which adorn the vaults are, here, full of emblematic and allusive design upon which we cannot dwell. They are per-

FIG. 14.

haps not altogether as happy in effect as those in the Northern and Southern Vestibules; but this is partly caused by the less graceful form of the Vault itself, which is much wider and flatter, and in which the penetrations of the lunettes are less agreeably proportioned to the main cylinder. The archways on the right, in Fig. 14, lead to a secondary and narrow vestibule beyond which is a still smaller lobby adorned by admirable paintings of Mr. Elihu Vedder. On the right of the spectator, one of the Vedder lunettes is dimly seen, in deep shadow. It is through this lobby and be-

neath the largest of the Vedder lunettes that one enters the great reading-room. Figure 15 gives the interior of the reading-room looking southward. On the right is, not seen in the illustration, the principal entrance; the only entrance for visitors and students. The great piers, eight in number, which carry the vaulting, are of Numidian marble for the greater part of their height, resting on high dados

FIG. 15.

and pedestals of Tennessee marble; the color of this latter is dark purple, and that of the columns and pilasters, up to the capital, is a peculiar reddish brown; the capitals themselves being gilded. Money-saving contrivances are rather freely used here; the marble facing which we have described is but a facing to piers of solid brickwork, and the capitals are of plaster. In like manner, above,

the wagon vaults over the lunettes, the pendentives of the dome, and the great dome itself are all plaster simulacre. No doubt it is all strong enough and will endure, but any admiration one may feel for it is such admiration as clever scene-painting calls for. Architecture, in the highest sense, it is not. As a decorative design it is, however, fortunate. The great columns fills the re-entrant angle

FIG. 16.

cleverly, and the proportions of the great piers to the vaulting remind one pleasantly of the best eighteenth century designing. The screens between the great piers are of yellow Siena marble, and it is recognized that there is in the design of these a rather violent transition from the severe Roman arcade of the lower row to the fanciful Renaissance arcade of seven arches above. By means of this change

in the system, however, the statues on the pedestals of the parapet are brought to their right places; they are well spaced with regard to one another and to the great piers. These statues are badly placed to be seen from the floor of the reading-room, for they are seen against a dark background of solid wall, while, immediately above them, there are the great lunettes filled with clear glass through

FIG. 17.

which there pours a flood of light which dazzles the spectator. There are symbolical figures above the entablature of the great piers; these are also of plaster, but they are none the worse for that. It is announced that they will be cast in bronze or cut in marble when Congress allows of that additional outlay; and to put them into the more costly and more enduring material will be to do them deserved honor. Yet, as long as the broad entablature above, with its elab-

orate floral sculpture, its cartouches and their supporters continue to be of plaster, and while the same less expensive material is used for the decorative figures in the pendentives and the very elaborate entablature below at the springing of the lunette-arches, so long the architectural display does not require the change from plaster to bronze. Let it be clearly understood that nine-tenths of the im-

FIG. 18.

portant sculpture which the modern world produces is exhibited for the first time in plaster, is judged by fellow artists and by the public while still in the plaster; that, in short, sculpture is a matter of pure form, indifferent to the material in which that form is embodied. Never let us despise plaster, or stucco, or gesso, or chunam, or gatch; these easily-managed and inexpensive materials are the most convenient things in the world, and without them the plastic

arts could hardly be practiced. It is only when they are used to cover up a cage of wood or iron while their surface is moulded into forms which are those of continuous, solid masonry, that these materials can, even for a moment, seem contemptible. As for the symbolical figures themselves they are of singular importance individually and in conjunction with the general design; but there is crying need of their being advanced into the rotunda and being thus freed from their much too close contact with the spandrels and the archivolts behind. It must be observed that each spandrel is also a pendentive, and, therefore, has a surface which rounds inward as it rises, and seems to force the head of the statue away from its proper pose. The broad top of the cornice at that point would allow

FIG. 19.

these statues to be set two feet further toward the centre of the dome, and that is what is important.

The connection of these symbolical statues with the bronze portraits and ideal portraits below them on either side, must be noted. Illustration Figure 16 shows two of the bronze portrait statues, the Shakespeare, by Mr. Frederick Macmonnies, and Chancellor Kent, by Mr. George Bissell. These two statues, however, are not a group, but each one of them forms, with the symbolical statue nearest to it and the bronze portrait on the other side of that, a group of three figures with special significance. Thus, Figure 15 shows, high on the left, the symbolical figure of Law, by Mr. Paul Bartlett, and shows below, to the left, the Solon, by Mr. Ruckstuhl, and a little to the right, the Kent, named above. The vacant pedestal seen above the great pier on the right in Figure 15, has since received the statue of Poetry, by Mr. J. Q. A. Ward, and the flanking bronzes of this group are the Shakespeare already named and the

Homer, by Mr. Louis St. Gaudens. So, in Figure 17, there is seen in the distance the symbolical figure of History, the work of Mr. Daniel C. French; and, flanking this, the bronze statue of Herodotus, also by Mr. French, and Gibbon, by Mr. Charles H. Niehaus. The two bronze figures in the foreground are, on the right, Robert

FIG. 20.

Fulton, by Mr. Edward C. Potter, which statue is one of the supporters of the symbolical figure Commerce; and Plato, by Mr. John J. Boyle, one of the supporters of Philosophy.

The dome is an unsatisfactory design, as seen from within, paneled with caissons too small and too strongly marked in form and color; a restless, rather than a dignified composition. It is covered thick with arabesques, which are, as nearly as possible, thrown away. This dome culminates in one of the noblest pieces of mural decoration of modern times; the paintings of the so-called Collar, which is a nearly flat band twelve feet wide. This has been adorned by Mr. Edwin H. Blashfield with a really superb composition of seated allegorical figures. As it stands this great design does not tell forcibly upon the decorative effect of the rotunda. Even in connection with the very beautiful painting which fills the circle above—the circle which forms the ceiling of the lantern and is a keystone to the composition below—these paintings do not affect the interior. Whether a simpler and, therefore, a better conventional decoration of the dome below would help this, it is hard to say. As it now is there is only to record the presence of a very fine piece of decorative painting which, its scale, its distance from the eye, its lightness, and its surroundings will not allow to do its full work of decoration.

Leaving the rotunda one comes out into the Eastern vestibule and into the main stair-hall. Figure 18 gives the view which the

visitor has as he turns to look back at the entrance to the reading-room. The richly-adorned archway which is called "the commemorative arch" has on its attic, which forms the parapet for the upper floor, a long inscription recording the names of the directors of the building and the dates. The sculptures in the spandrels of the arch are those important reliefs by the late Olin L. Warner, "The Students," which were exhibited in the plaster at the Architectural League Exhibition two or three years ago. Beneath this arch is seen a part of that elaborate mosaic ceiling of the Eastern vestibule, and beyond this again, the largest of Mr. Vedder's lunettes, "Government," the central idea. And now, one hesitates whether to leave unnoticed, for the moment, the varied and really magnificent display of decorative art in the great staircase hall, and to go on, upstairs, to the galleries and pavilions of the second story. It is an anomaly which, however, one accepts, that this great hall of entrance and ascent is the most ornate part of the building, and also contains the largest superficial area of any single pavilion; more even than the great octagon of the reading-room. It is also full of ornamental art of many different kinds, and it seems better to finish our account of the building by noting its artistic contents as we finally descend the stairs. If, therefore, we take the northern flight of stairs and reach the second story (see Figure 2), we may at once enter the West North Gallery. This large room, lighted by windows on either side, is almost exactly like the one shown in our Figure 20. The main difference between the West North Gallery and the West South Gallery shown in Figure 20 is this, that the paintings in the broad lunettes in the more northerly of the two halls are by Mr. Gari Melchers, and represent War and Peace. Passing through this gallery, then, we enter the North West Pavilion, which is decorated by Mr. William de Leftwich Dodge with four great tympanums and with that very important circular painting in the ceiling, which painting was exhibited not so very long ago, in the rooms of the American Art Association, on Madison Square. Fig. 19 shows one angle of this North West pavilion with parts of two of the lunettes, Music and Science; and between them the rondel in high relief, Winter, by Mr. Pratt, one of the same series of four which is repeated in all the pavilions. It can be partly seen from Figure 19 how very awkward is the architectural form given to these corner pavilions; but it cannot be seen how bad is the effect of the extremely low and flat cupola seeming to bear heavily upon the very inadequate pendatives where the Pratt rondels are, and seeming to crush the flat and low lunettes in which are Mr. Dodge's paintings. The reason given for the clumsiness of this design is the necessity supposed to exist of keeping the vault low, so that the attic story of each corner pavilion should be left

open and free as a separate room. It would have been a small sacrifice of space and of immeasurable value to the interior effect of the building had these corner pavilions been devoted, above the floor of their second story, to one well-proportioned and stately apartment, nearly fifty feet each way, and of about the same height.

FIG. 21.

Equally well if, indeed, it were essential to keep the attic room, the present height would have served all purposes of architectural effect, but, obviously, with a totally different system of design. Where would be the objection to a heavily-framed floor with girders and deeply-recessed panels between them? One immense advantage of such a floor, of which the underside should act as the roof of this great room, which have been the giving to Mr. Dodge—as in the other pavilions to his brother artists—parallelograms to cover with

his elaborate allegorical designs instead of the most ungainly lunettes which the present system has provided.

Returning now to the central stair-hall and crossing it towards the south, still on the second floor, the visitor enters the West South Gallery, shown in Figure 20. The paintings in the lunettes of this room are those important designs by Mr. Kenyon Cox, studies for which have been exhibited in New York. The subjects of the

FIG. 22.

paintings are The Arts and The Sciences, of which the latter is shown in Figure 20. Astronomy is seated high in the center, Mathematics and Physics are on the spectator's left, Botany and Zoology on the right. The gallery, itself, has not an important architectural character, having a painfully transparent sham of a plaster vault for its ceiling and extremely feeble treatment of the walls with a huddle of window-trims and pilasters, as if a scrap of solid wall would offend. The proportions of the room are not bad, but its effect depends chiefly upon the painted lunettes for its adorn-

ment. It is, therefore, the more to be regretted, perhaps, that the tone of color of the two paintings is disappointingly pale. The very noble and refined line-composition might have been clothed in warmer color, one thinks, with advantage to the pictures themselves and to the room which they complete. Figure 21 is one of the long museum halls in the curtains, this one being that which fills the

FIG. 23.

south curtain, and is nearly 220 feet in length. These rooms, with their skylights, are rational and well-fitted to their purpose; nor will the plaster cornices and coves look so unreasonably heavy when the cases, tables, etc., shall have been put in place. Perhaps there will always be the look of sagging in the middle which such a flat roof with skylights is apt to present. Much might be done with

these rooms with more carefully-considered coloring. Chromatic decoration is, with us, a secret known only to those masters who are also masters of descriptive and expressional painting. There are, indeed, several artist-painters who have not by nature that power

FIG. 24.

of artistic expression which a few of their abler comrades possess, but who have the color sense and are excellent in such painting of traditional ornament as our books of examples furnish. The designing of patterns—borders, scrolls and friezes—is, indeed, a lost art, but if one of those able colorists could be given a free hand in these cheerless galleries, these galleries might be greatly aided in their architectural effect.

The low door, on the left, in Figure 21, leads to the south stack, and the three doors at the end, lead directly into the South East Pavilion, in which the paintings are by Mr. R. L. Dodge and Mr. Garnsey. The South West Pavilion, behind us, in Figure 21, is decorated by Mr. George W. Maynard. There is still a fourth pa-

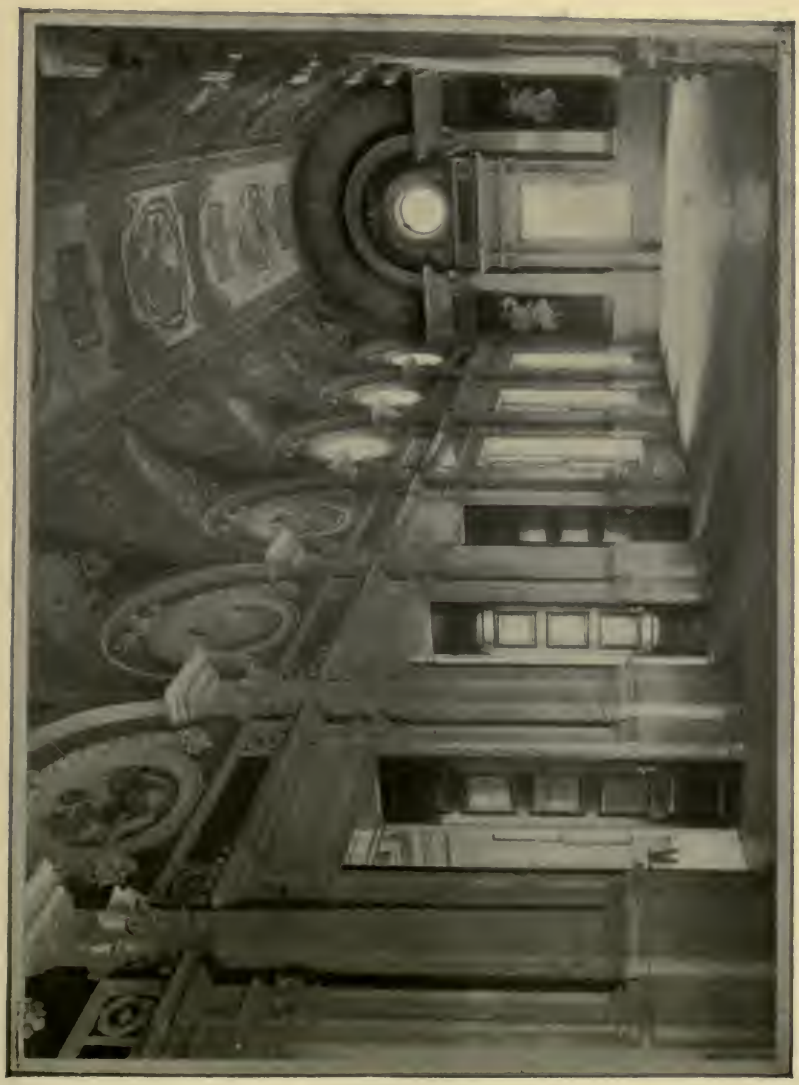


FIG. 25.

vilion on this floor—namely, that at the northeast angle of the building, which is called the Pavilion of the Seals, and is adorned with paintings which are more abstract and less descriptive than those in the other pavilions. The paintings are by Mr. W. B. Van Ingen and Mr. Elmer E. Garnsey.

If, now, we pass northward out of the West South Gallery where Mr. Cox's pictures are (see Figure 20), we enter the staircase hall by the three doors seen on the right in Figure 22. This part of the second story hall is called the South Stair-Gallery of the Entrance Pavilion. In Figure 22 the spectator is standing at the ex-

FIG. 26.

treme front, or western end of this broad corridor, and on his left is the well-hole of the great staircase. The vaulting over his head is no longer of masonry, but is mere form without substance. The walls, pilasters, columns, pedestals, and the rest of the architectural frame-work is either faced with or composed of grayish white veined marble, and the rounded surfaces of the ceiling are covered with

painting in vivid colors of such character as the sixteenth century artists of Italy made up from their study of Roman remains. If the spectator turns on his heel and looks northward, he has before him nearly the view given in Figure 23. The great corridor before him is the West Stair-Gallery, and the well-hole of the great staircase is on his right. The windows on the left look out toward the

FIG. 27.

Capitol and the round ones which fill the lunettes above are those in which are placed the portrait busts already spoken of in our description of the exterior. Again, if the spectator walks half way along this corridor towards the north, he will have, looking northeast, the view given in Figure 24. The reader is requested to study the plan at this point and to note the unusual disposition of the

coupled columns. A comparison of the plan with these three illustrations, 22, 23 and 24, will show how these pairs of columns are all set north and south, with the result that those pairs of columns which follow one another across the Entrance Pavilion from east to

FIG. 28.

west seem to have a very heavy wall to carry, while whatever wall may be carried on the coupled columns in the other rows can only be a thin one. It is not asserted that the actual construction of the pavilion requires this arrangement of very heavy cross walls marking the subordinate pavilions on the west front with thinner walls connecting; but it is evident that this is a perfectly conceivable system of construction, and that the result in the architectural

effect of the interior is most fortunate. This disposition of the pairs of columns gives singular vivacity and play to the perspective of the interior. It is rare that a modern using the Roman orders would consent to treat them so informally and make them his servants and helpers; his tools to work with instead of his unchangeable tradition.

Figure 25 is the North Stair-Gallery seen by one who looks eastward; the great doors on the left being those which lead to the West North Gallery, the one where Mr. Melcher's Peace and War lunettes are placed. Finally, to complete the circuit of the corridors on all sides of the great staircase, Figure 26 shows the East Stair-Gallery and the curious stairway which leads up to the balconies of the rotunda—namely, to those balconies which the spectator is standing in as he enjoys the views given in Figures 16 and 17. As regards the painted decorations of this second story of the staircase hall, with its elaborate system of seeming vaults, lunettes and panels of wall, it is to be noted that it is curiously strong and vivid in tone and yet with an almost wholly agreeable result. There is nothing more attractive than the unexpected pleasure which is to be found in this combination of vivid color with large surfaces of polished grayish-white marble. As seen from below (see Figure 18), or from the floor of the second story, as in all the Figures from 22 to 26, the general effect is equally agreeable, and surprisingly so. It is hardly worth while to describe the way in which the darker or cooler colors contrast with the warmer colors and the lighter ones because the photograph so often seems to contradict what one is saying, and is sure not to confirm it in any positive way. The painting in the North Stair-Gallery has been more or less modified by Mr. Robert Reid, who is the author of the paintings in the rondels seen in Figure 25, and also of the octagonal panels in the roof, faintly seen in the same illustration. In like manner, the painting in the South Stair-Gallery, conforms more or less to the system adopted by Mr. Frank W. Benson, who is the author of the rondels shown in Figure 22, and of the octagons in the ceilings. Mr. Walter Shirlaw has painted the upright panels with large figures in them, which are seen in Figure 23, between the lunettes on the left; and in Figure 26, the large panels in a corresponding situation, are the work of Mr. John R. Barse, Jr. The wall panels everywhere in this series of corridors are the work of Mr. George W. Maynard, the figures being relieved on a ground of Pompeian red. It has been said that the taste of each of these artists has somewhat modified the coloring in the corridor which he has worked upon, but it remains true that the system of color decoration has been held in hand, and that we are compelled to put the names of Mr. Garnsey, the general director of color decoration, and of Mr. Casey, the architect, as general authors of the whole system of adornment so suc-

cessfully carried out. It is, indeed, somewhat abnormal that these really superb corridors should be put there for their own sake, apparently. Indeed, they seem to exist for their own sake, so much more lofty and more important do they seem than the galleries to which they lead, and so wholly without utility is the Western Stair-

FIG. 29.

Gallery for its whole length of about 130 feet, stretching from north to south of the Entrance Pavilion. It is not, however, without a higher use in so far as this great combination of halls in two stories with elaborate staircases to connect them will always be open to visitors even when the work of the Library partly shuts off the other rooms of the building from free public access; and in so far as this rich adornment will exercise a beneficial popular effect.

Leaning over the parapet of the South Stair-Gallery and looking

northwesterly, we look down upon the northerly stair, as in Figure 27. The tall bronze figure, serving as a lamp-stand and set upon the newel of this stair, is the work of Mr. Philip Martiny. The arches to the left of that figure and newel lead to the Main Vestibule and out of doors; those to the right open into the Northern Vestibule, where are the paintings by Mr. Pearce. The very elaborate adornment of the staircase with child-figures and festoons, as well as the group of two putti with a globe above the niche, are all the work of Mr. Martiny. The very interesting arrangement of the newel, with the handrail carried around it, probably, the design of Mr. Pelz, and it is, perhaps, to that artist that the general disposition of the stairs is to be accredited. In Figure 27 are also to be seen, in the second story, the doors leading into the West North Gallery, and a fragment of Mr. Gari Melcher's picture of War. Above these doors are seen also the circular pictures by Mr. Robert Reid. In Figure 28 is seen the newel and lamp-holder of the south stair and the Martiny figures of the hand-rail and central composition of this stair, corresponding closely with those of the northern one, seen in Figure 27. The group of two children in Figure 27 stands for Europe and Asia, that in Figure 28 for Africa and America; but their meaning is obviously of less importance than their effect as pieces of decorative architecture. At the extreme right under the arch is seen a little of the Main Vestibule with a single one of Mr. Herbert Adams' console figures. Finally, in Figure 29, there is given the view which any one will have who, standing on the first floor in the Southern Vestibule looks northerly across the lowermost platforms of both staircases toward that wall of the Northern Vestibule where Mr. Pçarce's lunette of Labor is plainly visible. The visitor who takes this last look at the decorative interior which he is about to leave may well retain it in his mind as characteristic of the whole effect of the stairway hall and its dependencies.

The above is an inadequate description of a building which has been completed for somewhat less than the appropriation; which has been built without large general contracts; the details of which have been designed from time to time as the building progressed; the richer sculpturesque adornments of which have been created partly by a sculptor permanently employed and partly by distinguished men engaged for the separate pieces of work; the color decoration of which has been managed throughout in the same way; all the artistical details having been brought into being without haste and as they were found suitable. To say that the building in all its parts might have been still better had it been guided from the commencement by a supervisor as competent and as resolute, in the artistic direction, as has been, clearly, its administration in the way of materials and construction, is to say that the community ought to be

more civilized. "We're crude in some things here," in the words of one of the late parodies on Mr. Kipling, and with the author of that parody, the fact we much deplore. Obviously, the one thing in which we are the crudest is that of fine art, in cases which are not those of the single Paris-taught painter working in his studio and summoning up all tradition and all teaching to his aid—but fine art in great masses and on permanent exhibition, the work of many men agglomerated together in a great public building. The New Library of Congress is a model for our future proceedings, and the men who have organized it and carried it out, deserve the quite unbounded thanks of the whole community.

Russell Sturgis.

MARSEILLES—AN OLD VIEW OF THE OLD CATHEDRAL.

FRENCH CATHEDRALS. Part XIII.

THE MARITIME CATHEDRALS. II.

I.

THE visitor to Marseilles, even if he does no more than rapidly drive through the city, is sure to have his attention directed to the magnificent new cathedral, built directly on the Mediterranean, at the very sea-entrance to the busy port, a situation quite unique among the cathedrals of the world, and recalling, in a very splendid way, the ancient fashion of the maritime cathedrals, built directly on the sea. That superb edifice, the largest, if not the most costly modern church in France, is more likely to hold the eye than the misshapen, decaying fabric of the older cathedral of La Major, fast crumbling into ruins close beside it. And yet that decaying mass will enable the general traveller to obtain an excellent conception of the methods of the Romanesque of the far south, and afford the student not a little light on the construction of churches in Provence in the eleventh and twelfth centuries. But this is within: for the exterior exhibits nothing of interest, the somewhat monumentally designed entrance that formed the south façade, built in the seventeenth century, having been removed in the present, when a portion of the structure was taken down to make way for the new cathedral.

Like many of the churches in the south, the church of La Major derived its chief importance from its rank as the cathedral of Marseilles, and the traditions that centred around it. Once, it is supposed, it extended considerably to the west, but no definite record has been preserved of its ever having greatly exceeded the site of the present structure. It has the usual plan of a nave with aisles and three apses, those of the latter having long since been removed to

OLD AND NEW CATHEDRALS OF MARSEILLES.

make way for the present rectangular chapels, while the extension of the choir towards the west for ceremonial purposes makes the actual internal area seem much smaller than it really is. The central bay of the nave is covered with a dome whose construction distinctly recalls the dome of the cathedral of Avignon. A series of arches rising on the inner faces of the east and west arches which enclose the bay below, form a square. In the corner are small pendentives, with symbols of the Evangelists, supporting an octagonal dome, with flat ribs on the edges of the octagon. A modern window has been cut in

MARSEILLES CATHEDRAL—INTERIOR OF DOME.

the north and south faces. Strangely enough, this cupola was closed by a lower vault, built towards 1480, and not removed until 1704, when the original structure was uncovered to the very considerable astonishment of those who brought it to light. It is decorated with frescoes, now greatly defaced.

The semicircular apse, with its small rectangular bay, immediately before it, is also characteristic of the period of the church. Its vault is carried on large ribs, resting on corbels on the lower surface of the semi-dome. On the wall below is an arcade with square pilasters. Some old views of Marseilles (1567-1570, 1614, 1650 or 1660) show

a large semicircular tower surmounting the apse, but there is no record of its disappearance. Two square towers once flanked the church; the present tower, built before 1627, adjoins the face of one of these.

The cathedral now contains but one monument of general inter-

CATHEDRAL OF LA MAJOR, MARSEILLES—PLAN.

From Bousquet.

est, the charming fragment of the Renaissance, known as the chapel of S. Lazare, the head of that saint having been the chief treasure of the church until it was removed to the modern cathedral. The chapel is of white marble, and was built between 1475 and 1479, and entirely completed by 1481. The architect was Thomas de Como, and the

sculptor François Loreaba, a celebrated medaillear. It consists of two arches, supported on delicately carved pilasters at the extremities, with a similarly decorated column in the centre, which is said to have been taken from a temple of Diana, though its decoration is certainly not antique. Smaller pilasters above these, supporting the crowning frieze, have each a small statue on the face; in the centre is S. Victor; to the right, S. Lazare; to the left, S. Cannat. Over the freize, which is plain, is a richly carved semicircular pediment, one above each arch. Small statues stand on pedestals between them; at the extremities, a bishop, a father of the church; in the centre, Our Lady. Each pediment carries a statue on its apex, S. Mary Magdelene on one, and S. Martha on the other. It is said that these last two statues were formerly in the pendentives of the dome, and were only put in their present place in 1823 or 1824; but this statement does not appear to be wholly authenticated. The chapel is a shallow structure; nothing more, in fact, than the archways; but it is a really notable monument, and is the single object of artistic interest within the cathedral.

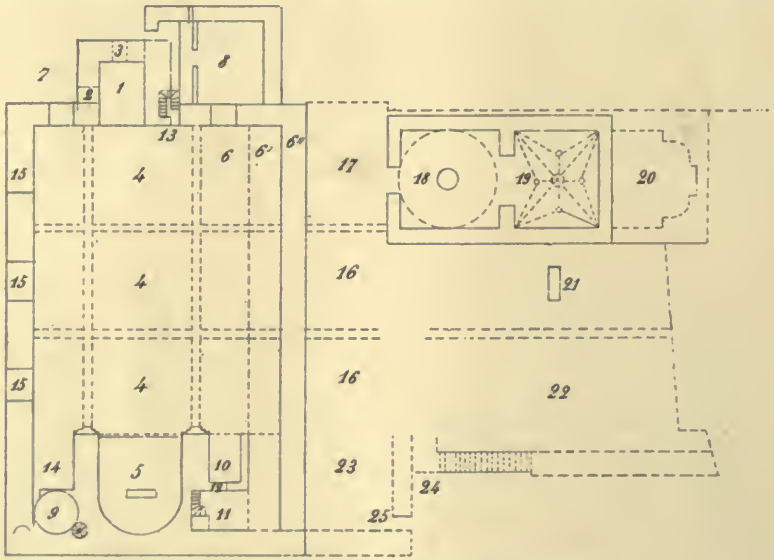
II.

The traveller who visits Toulon for the single purpose of seeing its cathedral is destined to encounter the bitterest disappointment of his journey in France. It is not the cathedral that attracts one in this bright, bustling, military seaport, but the active life of its streets, its massive fortifications, its harbor, its crowds of sailors and marines. War permeates its streets as it does its waters, and few French cities offer such gay street scenes or present so many aspects of modern life. The cathedral is one of the largest of the maritime churches, and it is also one of the most uninteresting. That means a good deal, for if a French cathedral is not of the highest interest, it is apt to be at the other extreme and touch the very lowest notch of insipidity. All through the south one is coming upon churches that require the earnestness of an enthusiast to excite interest in them; but the most indefatigable cathedral visitor quails before the heaviness of Toulon, its mixed piers, its indiscriminate arches, the poverty of its façade, the general artistic squalor that permeates the whole building.

Yet the history of the church is not devoid of interest. Originating, so far as some fragments of the present structure are concerned, as early as 1096 or thereabouts, it had the form, in the twelfth century, of the churches of that period—that is to say, a nave, two aisles, a semicircular apse, and a tower at the west end. Of the details of this structure so little has survived that it is impossible to determine its character. Succeeding centuries doubtless saw many alterations in its fabric, but almost the whole of the early church disappeared in

the changes begun in 1654, when the cathedral was largely added to on the north side. So great were these extensions that what had been the length of the church then became its breadth; the ancient choir became the chapel of S. Joseph and a new, high altar was erected towards the north, the orientation of the cathedral being completely reversed. The chapel of the Virgin that once stood free from the church, became an integral part of it.

The time at which these radical modifications were made was neither conducive to original work nor favorable to archaeological accuracy. The interior is, therefore, a singular jumble of columns and piers and arches, reproducing older forms in some instances,



SKETCH PLAN OF THE CATHEDRAL OF TOULON.

From Rossi.

4. Original nave.
5. Ancient site of apse and high altar.
16. Addition of 1653.
21. Place of high altar.

starting out with new motifs in others, and producing such a mixture that the spectator, lost in the labyrinth, wonders amazed that such things could be. The façade, built about 1696, is a heavy design in the taste of the time, with two stories of engaged columns supporting a pediment. It is not wanting in a certain dignity, and the traveller returns to it with a sense of satisfaction after the depression caused by the interior.

III.

One who would take satisfaction in the gay life of Toulon and the comfort of its modern hotels, would not be apt to visit Adge, save

for a day's outing from Béziers, whence one could make a delightful excursion. It seems impossible to believe that this sleepy little town was once a famous seaport, filled with an activity scarcely less than that which to-day distinguishes Toulon; yet such is the case, and the silent brown cathedral, rising just above the quay on the river, with its

AGDE CATHEDRAL—VIEW FROM THE SOUTHWEST.

solemn battlemented walls, and its donjon-like square tower, testifies to its former importance, as well as to the dangers that once beset its inhabitants. Here, at last, one meets with the maritime fortified cathedral of the twelfth century in its fully developed form, a church with strong, sturdy walls, buttressed without with a regular series of

plain arches carrying battlements, with openings behind the arches, from which the missiles might be projected upon too daring assailants; and the tower, so strong and severe in its building, with scarce an opening save directly within the machiolations at the top, as to seem rather part of a fortress than an integral feature of the House of God.

AGDE CATHEDRAL—INTERIOR.

The cathedral is a rectangular building, with a straight roof-line, seeming more a castle than a church, its pointed roof being hidden within the battlements. Its silhouette is both striking and fine. The tower presents a superb and impressive mass that groups admirably with the cathedral, small as it is. It needs only a clearing

AGDE CATHEDRAL—TOWER.

away of the buildings now against it to show its real and complete beauty. The modern traveller is fascinated by its novelty of aspect more than by its beauty, for that consists simply in the regularity of its design, its windows being scarcely more than slits in the wall, and its only external ornament, the piers that carry the arches on which the battlements rest. The entrance, which is close by the tower, is an unimportant addition of the last century.

Within, it is as simple as it is without, only here one has not the fascination of the sobriety of the exterior, nor the sense of dignity due to its massive form. It is a single chamber, without aisles, the interior consisting of a hall roofed with a pointed tunnel vault, the walls being marked off into bays by plain arches, six in number, carried on rectangular piers that, unfortunately, have been cut off below to make room for an unimportant wainscoting carried around below them. On the south side is a chapel, which is a portion of a cloister enclosed, and so much rebuilt as to be practically modern. Its exterior is decorated with arches, arranged in groups of three, surmounted by a battlement.

Bristling with war as this cathedral is, it is only a fragment of a former time that has survived in the midst of surroundings now wholly given over to peace. Adge is no longer a port of importance, but one of the smallest towns on the coast. The gentle smiling river, above which the cathedral raises its frowning walls in most startling contrast, would afford a site of almost unsurpassed beauty were it not for the ugly houses between it and the church. But a day at Adge will not be misspent, and here, at least, the architecture of the maritime cathedrals of France can be seen and studied, and enjoyed —though in the midst of somewhat primitive surroundings—in the full vigor of its maturity and in a most excellent state of preservation.

IV.

At Adge one sees the military cathedral of the coast in a well restored structure that retains the impress of its early utility in admirable form. The cathedral of Maguelone is another notable example of military architecture, but with so dismantled an exterior as to scarce seem more than a pile of ruins. Fortunately, its character can be clearly discerned, and the church has been so judicially restored within by M. Révoil that it is well worth a visit.

The adventurous traveller, intent upon varying his journey in as many ways as possible, may take the train from Montpellier to Palavas, a watering place of some local renown, and thence proceed to Maguelone by boat. For this strange cathedral is literally a church of the sea, being situated on a small tract of land almost wholly surrounded by the Mediterranean, and connected with the main land by a narrow strip. Once it was a very famous place, a port of renown, and here Urbain II. came on his way into France to attend the council of Clermont, at which the first Crusade was preached. So important was the town that the papal throne designated it as the Port of S. Peter, a distinction it retained for many centuries. Under Louis XIII., however, the entire town was swept away for military reasons, and everything save the cathedral destroyed. Its exposed position at all times is sufficient explanation for the intense military character of the architecture of the cathedral.

One may, indeed, still approach the cathedral by boat; but the more agreeable way will be to take a carriage from Montpellier and drive along one of those superb roads one meets everywhere in France. For half the distance the way is bordered on each side by a splendid row of lindens. But presently the landscape becomes somewhat bare, though the vineyards are continued on each side of the road almost to the very cathedral walls. The church is owned by the proprietor of these rich fields, Mr. Fabrège, who lives close beside it, the only individual owner of a real cathedral in France, whose life

has been consecrated to its restoration to worship and to the authorship of a monumental work on the history of Maguelone.

The carriage stops; and one wonders where the cathedral is; to the right is a high, rough wall, crumbling into ruins, supported by ruined buttresses, with the merest slits for windows. But there is nothing else in sight, save a couple of old buildings and a modern house that one speedily learns is inhabited by M. Fabrège. And, in fact, this ruined mass, this featureless pile, is the cathedral. The exterior defies description; yet even in its dismantled condition it clearly emphasizes its military origin. Its stout walls, lighted by narrow openings better suited to shoot arrows from at an intruder than admit daylight to a church, were built at a time when even this sacred struc-

MAGUELONE CATHEDRAL—SOUTH SIDE.

ture was exposed to the ravages of the infidel and the freebooter. The buttresses are not buttresses at all, but piers that once carried arches, similar to those that surround the walls of the cathedral of Adge, with openings behind their crowns from which missiles might be ejected upon an attacking party. Around on the west front there is the same evidence of decay, but the single pier in the centre of the façade retains fragments of the arches whose larger parts have long since fallen away. Here, also, is the base of a tower, a fortress in itself, with huge pier-like buttresses on the angles, that nearest the cathedral doorway being built out towards the top, doubtless to support a turret that, like the whole of the upper part, has disappeared.

The portal, which occupies the centre of the west wall, is the single part of the exterior that retains any ornamental feature. A flat lintel, carved with a broad band of foliage in low relief, is supported by two piers which are simply the endings of the wall. Above is a pointed arch within which is a representation of Our Lord seated in judgment, with the symbols of the four Evangelists around Him. Below the lintel, and beyond the stones that form its support, are two reliefs, one representing S. Paul, with his sword; and the other S. Peter, with the keys; the cathedral being dedicated to the latter Apostle. They are crude reliefs, with heavy fat faces, as is that of the Christ above, and of a much ruder form of art than the splendid sculptures of S. Trophime at Arles and other works of the twelfth century in

MAGUELONE CATHEDRAL—WEST FRONT.

Provence. They unquestionably belong to an earlier period than the actual construction, which is probably due to bishop Jean de Montlaur (1158). The lintel bears the date DMCLXXVII.

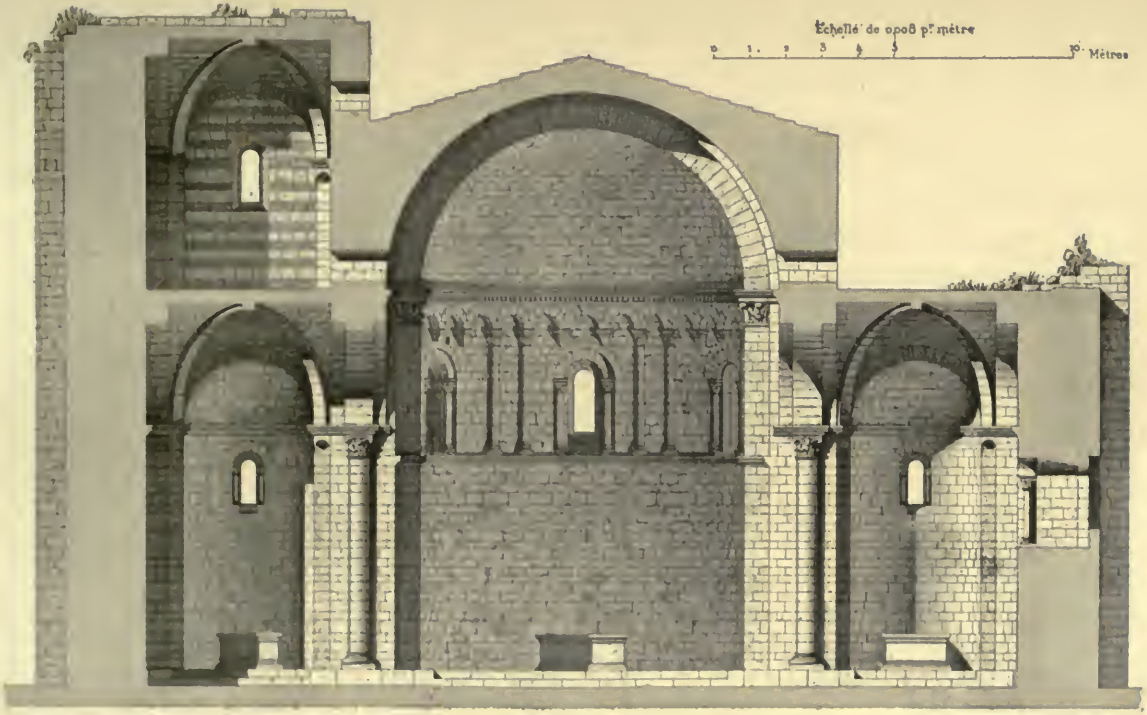
Once within the church the amazement that covers one at its external construction gives way to satisfaction at the very admirable and careful manner in which it has been restored. It consists of a nave of four bays with a semicircular apse. On each side, opening out from the fourth bay in transept form, is a chapel, also with semicircular apses. That on the north was built by bishop Galtier, and is dedicated to the Holy Sepulchre; it was formerly surmounted by a tower, as was the corresponding chapel on the south side dedicated

MAGUELONE CATHEDRAL—WEST DOOR.

to S. Marie. In the chapel of the Holy Sepulchre the mausoleum of Cardinal Raymond de Canillac was built in 1373, and it still retains tombs of members of his family. Another chapel on the south side opens from the third bay, and is dedicated to S. Augustine. This chapel is in two stories, and on the north side, in the corresponding position, is another upper chapel. Both are connected with a tribune or gallery that fills the first two bays, making the church, in this part, a two-story edifice. This was the gallery of the canons, and enabled them to reach the church without mixing with the populace, by

MAGUELONE CATHEDRAL—PLAN.

From Révoil.



MAGUELONE CATHEDRAL—TRANSVERSE SECTION.

From Révoil.

means of the upper cloister that adjoined it, all of which has disappeared.

The successive stages whereby the cathedral was added to towards the east have been indicated in the restoration by placing outlines of the former dimensions—real or supposed—on the floor. At the beginning of the third bay is indicated the outline of the cathedral built in the eighth century by Charles Martel, who took the city from the Saracens after a notable seige. At the beginning of the fourth bay is the outline of the church built by bishop Arnaud (1030-1060). The work of the latter prelate was continued and completed by bishop Godefrid (1080-1104) whose immediate successor Galtier repaired the apse, built the tower of the chapel of the Holy Sepulchre, and added a number of important conventual buildings to the cathedral group. Later on in this century other repairs were made by bishop Jean de Montlauer. The cathedral was dedicated in 1054.

There is little carved ornament in the interior. The windows are too small to require architectural frames, and the numerous squints, intended for defence, are rather irregularly placed on the south or water side and at the west end, and, like the windows, require no architectural treatment. The capitals of the piers and columns are plainly moulded, or of the usual Romanesque type, slightly carved with foliage. The interior wall of the apse contains the chief decorative feature of the interior, consisting of roll mouldings and columns at the three round-topped windows which light it. Below is an arcade of round arches, some of which are carried on columns, while others are supported by corbels. Several of the columns have been replaced by modern ones in the restoration.

In visiting the cathedrals of France one may, if one is so disposed, do much climbing of towers and roofs, but nowhere are the results of such exertion more amply repaid or more overpowering in their effect than at Maguelone. A dismal flight of steps built in the north wall of the cathedral, on the side where once the conventual buildings stood, admits one to the roof. The spectacle presented from this point of vantage borders upon the sublime. You are now at the extreme south of France, at the very entrance to the country, the port to which many a pope came on their tours above the Alps, a city famous in the development of the south. Behind you is the immeasurable blue of the Mediterranean, extending indefinitely into the background. And before you is the whole of France. On very clear days it is possible, from this roof, to distinguish the most westerly of the Alps on the one hand, and the most easterly of the Pyrénées on the other. The whole landscape is dotted with peaks famous in French history, but whose names and significance to the American are too often meaningless and unknown. But there before you is France, fair beautiful France, with its smiling vineyards,

its innumerable cities and towns, its history, its life. And it is a suggestive fact that of all the cathedrals of that wonderful country the one you are standing on is the only one that was a fief of the Holy See, and the only one suffered to fall into ruin, to be profaned and alienated from its sacred purpose, until restored to art and to worship by its present scholarly owner. The popes who began their visitations to France at Maguelone adopted a significant and picturesque route that the modern traveller, with all his manifold advantages, never enjoys.

The cathedral of Maguelone began to decay as early as 1536, when the bishops transferred themselves to the more flourishing city of Montpellier, using their former cathedral chiefly as a place of burial. The town was finally wiped out of existence by Louis XIII., though in its early history it was a place of great importance. Military stronghold as it once was, it is not a little striking that a walled city and a cathedral of some size should have risen in this place, far from the source of building material, and in a locality absolutely devoid of constructive appliances. Even as it stands to-day, the cathedral is an impressive illustration of the energy and faith of a time never baffled in undertakings in religious architecture by difficulties of site or remoteness of situation.

V.

The cathedral of Elne will conclude this survey of the maritime cathedrals of France. We are now on the extreme west side of the Mediterranean, not more than an hour or so from the Spanish frontier. Built in the middle of the eleventh century—it was in process of construction in 1042, and an altar was dedicated in it in 1069—the cathedral illustrates the architecture of the period, while its situation is sufficiently close to the sea to make its military character if not necessary at least due to some apparent reason. Like most of the southern cathedrals its exterior is almost devoid of features. Its walls show many signs of rebuilding and restorations, and they are utterly wanting in carved or ornamental features. There are no piers and high arches surrounding the walls as at Adge and Maguelone, but the west wall is surmounted by battlements, a feature reproduced in the crowning member of the south tower. This tower is, in truth, the only external portion of moment. It is a graceful rectangular structure, whose surface is treated in stories of round-arched arcades, separated by plain strings, the central arches of the two upper stages forming windows. It is an example of the Catalonian type of military tower, a place of refuge in danger, rather than a religious ornament. It was repaired when the cathedral was fortified by bishop Udalguer in 1140, and again in 1415, when it was

ELNE CATHEDRAL—WEST FRONT.

strengthened at the base, owing to disintegrations that had appeared in its structure. The north tower was never completed, but is surmounted by an inconsequential structure in brick. Neither tower is directly aligned with the centre of the façade nor with the lateral walls.

This unimportant exterior encloses a church of great interest. The cathedral has a nave of seven bays, with aisles, all three with an apse On the south side is a series of chapels, six in number, the tower at the southwest extremity filling the space of the seventh chapel. The first two bays of the nave are filled with a tribune, supported on cross vaults; the nave has a round tunnel vault carried on single arches that rest on engaged columns applied to the main piers, or on rectangular portions of these piers. All of the supporting members have been cut away in their lower part. The vault of the north aisle is a quarter circle in form, supported on semicircular arches that, on one side, rest on the portion of the pier separating the aisle from the nave, while on the other they are applied directly to the north wall, each bay, except the first, having a round arch cut in the outer wall.

ELNE CATHEDRAL—INTERIOR.

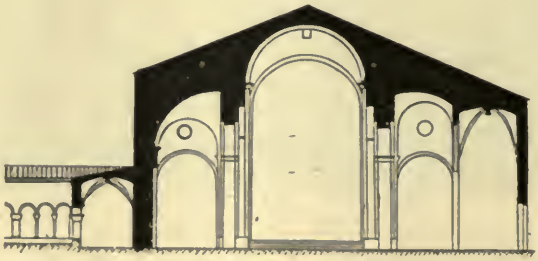
In the south aisle, which is narrower than the northern one, the vault is the same, except in the first three bays, where, owing to the height of the chapel vaults, it has been rebuilt as a segment.

The chapels offer little of interest. The most easterly one was built towards the end of the thirteenth century; the next one, to the west, dedicated to S. Augustine, between 1327 and 1341. The three westerly ones were added towards 1441 and 1448. At the west end of the north aisle is a small dark chapel, without windows, but now lighted by a small skylight cut in a section of the cross-vault. It is one of the lugubrious sanctuaries, extremely popular in the region, where the religious conception has a tinge of solemnity in striking contrast with the ardent nature of the people. A chapel that approximated a tomb had, for them, a realism that gave them the utmost satisfaction. The apses of the nave and aisles are unimportant, and have been, at one time or another, a good deal restored and changed; they are wholly devoid of architectural treatment.

The windows of the church are small and unimportant, several of them having been walled up, and the interior is, in consequence,

somewhat dark. It is not, however, wanting in that quiet dignity that all southern churches have, due to the sobriety of their structure. The proportions of the interior, moreover, are rather happy, both nave and aisles being unusually high for a church of this size. There is little ornamental detail, and what there is is chiefly in the capitals of the engaged columns supporting the main arches, several of which are rude in design and certainly not later than the eleventh century. The plan shows a number of irregularities, the piers vary considerably in design, and the arches, even when concentric, exhibit many irregularities. The piers of the nave incline slightly inward as they rise from the floor, a circumstance that the accomplished historian of the cathedral, M. Brutails (Monographie de la Cathédrale et du Cloitre d'Elne: Perpignan, 1887), believes to be a deliberate artifice practised by the builders. There are many indications of repairs and alterations to the piers and arches, though the records of their date have been lost.

A small door in the north aisle between the first and second bays, admits to the cloister, the most beautiful portion of the cathedral, and



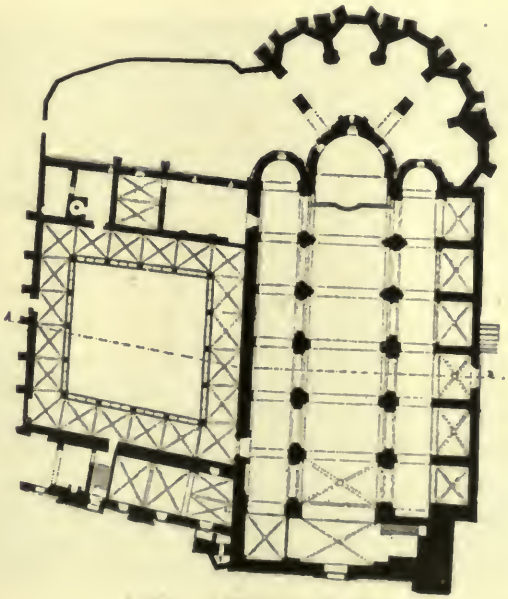
ELNE CATHEDRAL—TRANSVERSE SECTION.

From Brutails.

one of the most celebrated in France. The cloister of Elne is, in fact, known to many to whom the cathedral itself is unfamiliar. It fully justifies its celebrity, for few cloisters in France are more beautiful. As usual it is irregular in plan, the east and west galleries having a decided inclination toward the east at the north end. The west gallery adjoins an unimportant group of buildings, formerly used for the administration of the chapter, the hall of archives and other apartments. In the east gallery a small, low door towards the north gives access to a spiral stairway that once led to the upper cloister, removed in 1827; but a delicious view can be had from the roof, and we can well believe this place to have been a favorite resort of the canons attached to the cathedral. Another door leads to a small, low, rudely built subterranean chapel, formerly dedicated to S. Laurent. A vaulted hall, adjacent to the cloister and entered through a sacristy, was once known as the chapel of the Passion, or of the Blood

of Jesus Christ. It was in ruins in 1531, but was repaired by the end of 1534. The north gallery, overlooking a steep descent, is supported externally by a heavy buttressed wall.

The design is the usual type of the twelfth century. At each angle of the trapezoid is a large rectangular pier, rather plainly treated. The intervening space is divided into four bays by similar piers, whose capitals are rectangular panels decorated with scenes from the Bible and from legend, surmounted by a richly carved abacus. Each bay contains three round arches, supported on double columns—plain, twisted, octagonal—ornamented with series of closely set leaves or with interlaced bands of foliage, a charming irregularity that gives so much life and vitality to the whole. The capitals of the columns



ELNE CATHEDRAL—PLAN.

From Brutails.

are decorated with conventionalized animals, with scenes from monastic life, with episodes of bible history, or with foliage. In general, the capitals towards the quadrangle are foliated, those towards the galleries are pictorial; but in the east gallery both series are pictorial. The vaults are Gothic cross-vaults of the thirteenth century.

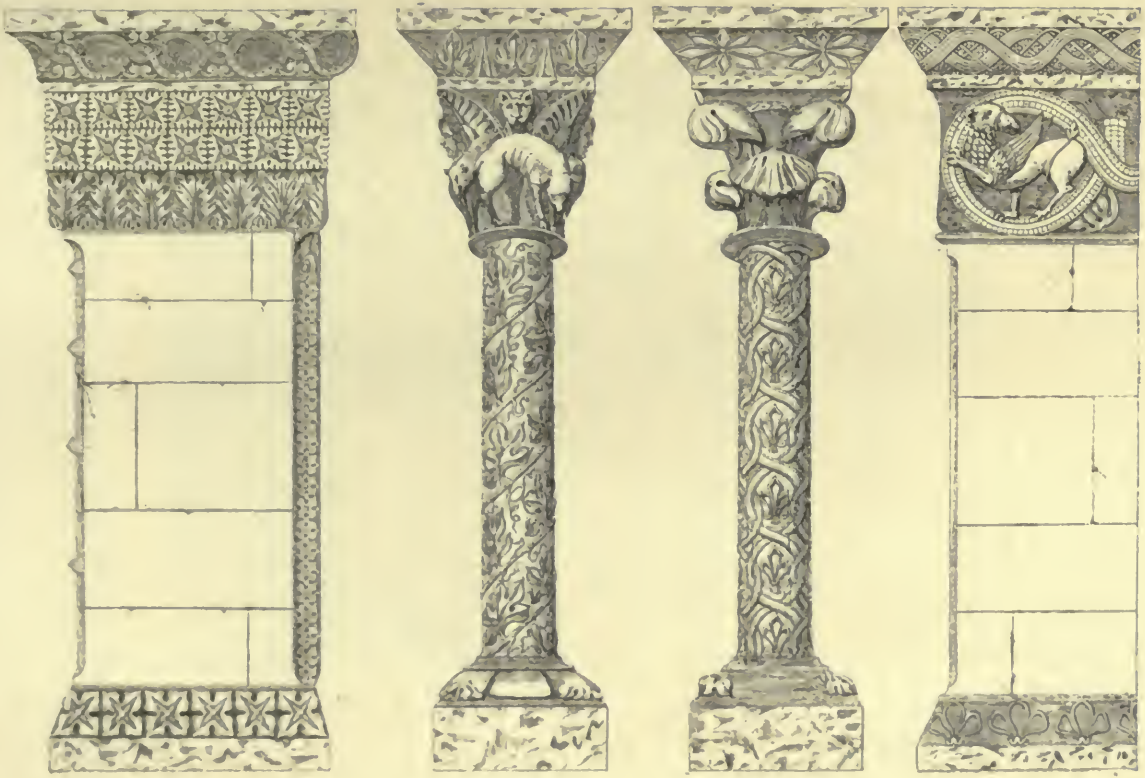
The diversity in this carving, all of which is of a delightful quality, is not confined to the design alone. There are many indications of varying dates, Gothic capitals in one place surmounting Romanesque columns, with many instances of a reversed process. So marked is this irregularity that it has been supposed by some writers that the cloister dates from at least two distinct periods. This, however, is not borne out by the facts. The differences are too closely

mixed and too well distributed throughout the cloister for this to be at all probable. On the contrary, it would appear that these changes were simply alterations, necessitated from various causes, and made from time to time as required. The cloister was built about 1175, under the episcopacy of Guillaume Jorda (1172-1180), the first prelate to be buried in it, and whose effigy may, perhaps, be seen in the sculptures of the central pillar of the south gallery. In 1285 the city was sacked by Philip the Hardy and the cathedral seriously injured. Repairs in the cloister were begun soon after, and the last work was done about 1385. The date 1285 is a notable one in the history of the cathedral; not only were restorations begun in the cloister, but the bishop and the chapter planned a new choir and apse, of which the

ELNE CATHEDRAL—THE CLOISTER.

foundations are still visible—a Gothic structure with radiating chapels—but which was never finished. Donations continued to be made to the repairs as late as 1404.

The charm of this cloister, as in all Romanesque cloisters, is in the superb carving of the capitals of the piers and columns. In a Gothic cloister it is the delicacy of the architectural forms that delights one, for as the builders increased in skill they developed a fondness for refined building rather than for the elaborate pictorial sculpture with which the Romanesque builders ornamented their structures. The architectural parts are somewhat heavy, though the vaults are not. The piers are of unusual size, with simple bases and a small roll moulding worked in on the edges. The arches, owing to the thick-



ELNE CATHEDRAL—PIERS AND COLUMNS IN CLOISTER.

ness of the cloister enclosure, are deep, generally treated with a hollow moulding towards the galleries, decorated with bosses or other small ornaments. In the west gallery, however, there is no internal ornament. Apart from the carved ornament in the cloister the chief feature of interest is the doorway, through which it is entered. Plain towards the church, on the cloister side it is developed into a charming Gothic portal, richly moulded, though without ornaments. The slender columns are alternately of red and white marble. Their capitals reproduce the foliage of the region.

The carved decoration includes a great variety of motifs. The capitals are foliated or treated with symbolic animals or with scenes from the Bible. Those of the great piers are more important, the sculptors there having more space, and space better suited for pictorial design. They are not, in fact, so much capitals as carved panels that fill the function of capitals. We have the creation, the death of the Virgin, the appearance of Christ to the Magdelene, the story of Lazarus and the rich man, the massacre of the Innocents, the adoration of the Magi, Christ on the way to Calvary, and other incidents. Many of these scenes are treated with the delightful frankness of the period; others are more complicated in their arrangements; but most of them are very clear and distinct in their meaning and purport.

From Elne the traveller in France must turn his face northward, and, in a measure, retrace his steps over the ground traversed in order to reach this little known portion of France. In our survey of the cathedrals of France we have more than once had occasion to visit the cathedral cloisters; but in our future journeys we shall meet with few of them. Not many of the Gothic cathedrals retain their cloisters, and the cloister of the south, the Romanesque cloister, is of a type peculiar to itself. That at Elne is of a type common to them all. It emphasizes an important period in ecclesiastical architecture and one takes away from it, not only that lesson, but the memory of a delightful and almost unknown corner of France.

Barr Ferree.

AMERICAN SOCIETY OF CIVIL ENGINEERS,

Cyrus L. W. Edlitz, Architect. 220 West 57th Street, New York City.

SCHOOL AT 108TH STREET, BETWEEN AMSTERDAM AVENUE AND THE BOULEVARD.

THE SCHOOL BUILDINGS OF NEW YORK.

TURN at once to the tailpiece of this article and see there the image of the "little red schoolhouse" of our youth.

Such, no doubt, was in the minds of the fathers of the republic when they first conceived of universal state education as a part of the government which they were founding. Profoundly astonished would they have been could they have seen the vision of what was to come, such as is shown in the picture of the latest and biggest schoolhouse at the head of the article.

For the people of those days, brief as the time in years has been, modern times had not begun. They could not fancy the ultimate northern confines of New York as farther away than Chambers street; nor that their descendants would smile to see that their fathers had built the north side of the City Hall of a rougher stone, the rest being of marble, under the impression that nobody would ever go around to the back of it—now, when there are ten miles of densely built city to the north for a single mile to the south! Even Paris at that day was but a town of half a million.

But modern times are upon us; have come upon us, and are still rushing on, with such celerity that we can scarce keep up with them. The vast modern city—a new thing in the history of the world—grows, as a microbe colony grows, millions almost in a night, so that we strain ourselves to build schoolhouse after schoolhouse, each fitted for its thousands of children, without outstripping our needs.

Until recent years the schools of New York were in a desperately bad condition, chiefly owing to this fact that their builders did not realize what was coming, as we ourselves probably are doing still the most inadequate things, judged by the light of the future.

Most of these buildings still survive, improved, as far as may be, with the means and opportunities at hand, and some day to be replaced, no doubt, by better things.

Such a building is the old school (sixty-three years old) at No. 371 Madison street, Fig. 1.

FIG. 1.—MADISON STREET SCHOOL.

In the back these old schools are still less prepossessing than in front.

Here, for instance (Fig. 2), is the rear of the Madison street school, a corner of the "playground," thus in name this hole is dignified.

This is the normal "playground" of the time, as the school is flanked only by comparatively small houses, such as that shown, low, and, what is even more important, of no great depth, leaving a passable supply of light and air for the playground.

In this case the house adjoining is but three stories high, and perhaps thirty-five feet deep; such as New York mechanics lived in before the day of the tenement house.

FIG. 2.—PLAYGROUND OF MADISON STREET SCHOOL.

What happened when great tenements were built in place of these small houses is shown on the next page.

This is the yard or playground of the Allen Street School (Fig. 3). The tenement-houses that hem it in cover almost every foot of the adjacent land, and enclose the school yard with lofty blank walls, that cut off all light, except what glimmers through the crevice that we see.

Another yard of the same kind—that of Chrystie Street School (Fig. 4)—showing a fire-escape, which is, of course, indispensable, as all of these old buildings were of combustible build, but which darkens most seriously the interior of the building as well as the yard.

In these last two pictures, notice the low buildings with sky-lights. These are the modern temples of Venus Cloacina, that have replaced the wooden privies of yore.

Inside these old buildings are as inadequate, although it is impossible to illustrate their condition so well, simply because the worst cases are too dark to photograph. Here, however, is one, obtained by forty minutes' exposure—photographers will know what

that means—yet to the eye it is much darker than the photograph shows it (Fig. 5).

It is the first, or entrance, story of the Twenty-third Street School, used, as the first story in all New York schools is used, as a playroom. The doors which have been opened to give light enough for a photograph, are the entrances from a playground, darkened as we have seen.

FIG. 3.—PLAYGROUND OF ALLEN STREET SCHOOL.

With one other illustration, this of a darkened classroom, found in a school in Seventeenth street, near Eighth avenue, we must content ourselves (Fig. 6).

Within a few years, under the able direction of the architect, Mr. C. B. J. Snyder, the Superintendent of School Buildings, a revivification has taken place in the construction of New York school buildings. Many problems needed solution in their arrangement and construction, as well as in the vital considerations of air and light, or rather in connection with these considerations.

One of the first and most important moves was toward securing more open space surrounding schools, that could be depended upon as permanent. In the case of many old schools adjoining land has

C. B. J. SNYDER,
SUPERINTENDENT OF SCHOOL BUILDINGS.

been bought, the buildings thereon pulled down and a portion of the new space covered with an addition to the school, still leaving a large part to illuminate and refresh the whole building.

Where new schools have been built, open land has been secured in various ways. In the outlying and half-country parts of the city, where the land was still cheap enough to permit, the school has been built in the midst of ample grounds, as in this one at the corner of Andrews and Burnside avenues (Fig. 7).

FIG. 4.—PLAYGROUND OF CHRYSTIE STREET SCHOOL.

In the more closely built parts the school was either built upon a corner, or sufficient space was left free within the boundaries of the school land, as we shall see in all the examples of the newer schools.

Such, for instance, is the school at 140th and 141st streets and Edgecombe avenue. (Fig. 8.) The building is one of the earliest of the new order of things. It has three fronts on streets, the principal, on Edgecombe avenue, being some two hundred feet long. The photograph of this school is interesting also because the open fields and market gardens, that occupied the foreground when the picture was

FIG. 5.—PLAYROOM OF 23D STREET SCHOOL.

taken, are now quite covered with four and five-story stores and flat-houses, standing shoulder to shoulder (Fig. 8).

Similarly situated, as to street frontage, is the school at 117th street, and St. Nicholas avenue, dating from the year 1894, shown in Fig. 9.

FIG. 6.—DARK CLASSROOM OF SCHOOL IN 17TH STREET.

FIG. 7.—SCHOOL AT ANDREWS AND BURNSIDE AVENUES, MORRIS HEIGHTS.

Another school with two street frontages, that at Ninth street and First avenue, built in 1895, is shown (Fig. 10); and another at Chrystie and Hester streets, built in 1893 (Fig. 11).

Admirable as are these sites with abundant street frontage, they have two serious defects: First, they are far more costly than are sites of equal area in the interior of a block; secondly, they are not

FIG. 8.—SCHOOL AT EDGECOMB AVENUE BETWEEN 140TH AND 141ST STREETS.

always to be had at any available price. For, although land may be taken by condemnation proceedings for school purposes, except when occupied by ecclesiastical associations, the cost of highly improved sites is naturally prohibitory. It is, therefore, necessary at times to arrange schools so that there may be enough vacant space within their own boundaries to supply air and light.

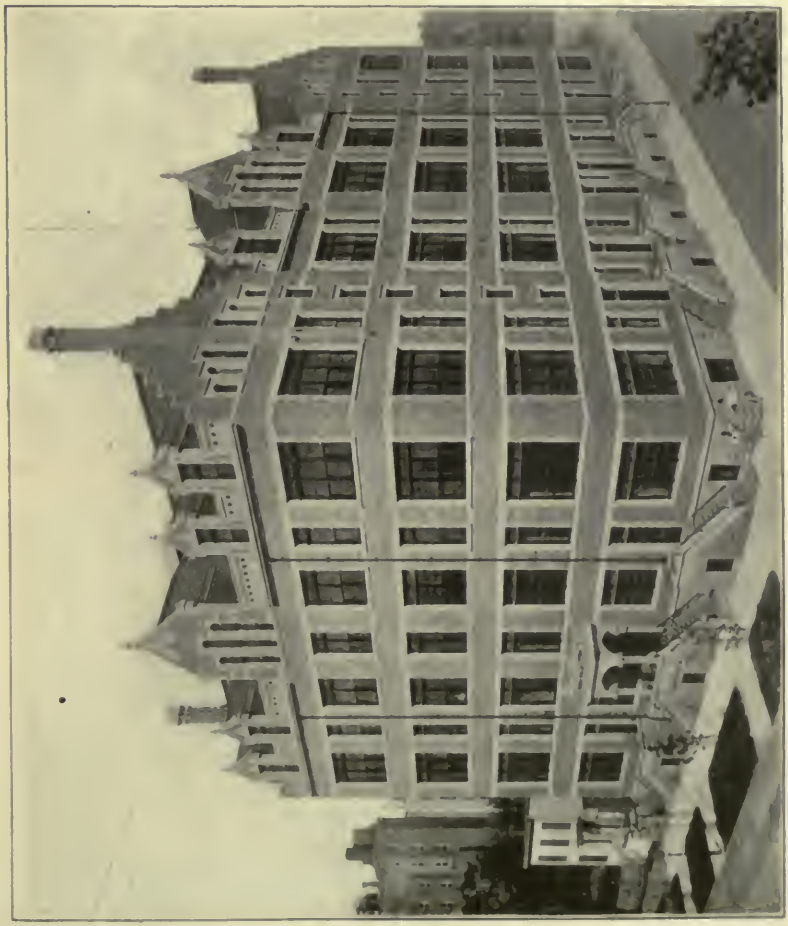


FIG. 9.—SCHOOL AT ST. NICHOLAS AVENUE AND 117TH STREET.

For an example there is the nearly completed school in Eighty-ninth street, between Amsterdam and Columbus avenues, of which a plan is given below (Fig. 14) and a picture of the outside. (Fig. 12.)

Another school, hardly yet completed, and occupying an ideal site for a city school, covering the whole of a block bounded by four streets, is shown (Fig. 13), and the plan, with large additional court yard space (Fig. 15).

FIG. 10.—SCHOOL AT FIRST AVENUE AND 9TH STREET.

FIG. 11.—SCHOOL AT CHRYSTIE AND HESTER STREETS.

FIG. 12.—SCHOOL AT 89TH STREET, BETWEEN COLUMBUS AND AMSTERDAM AVENUES.

FIG. 13.—EAST BROADWAY, GOUVERNEUR, HENRY AND SCAMMELL STREETS.

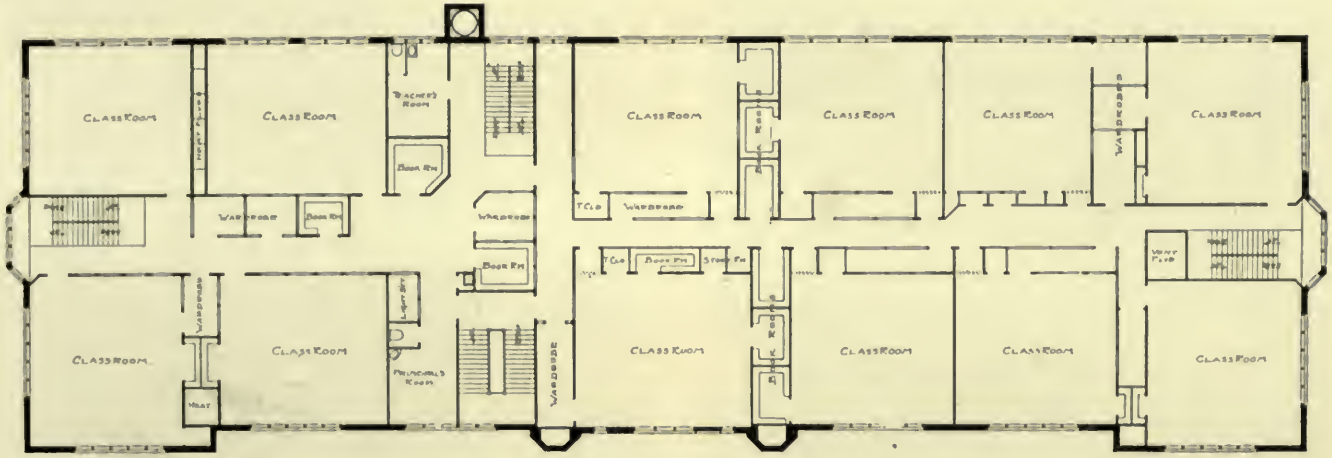


FIG. 14.—PLAN OF WEST 89TH STREET SCHOOL.

Most interesting, however, in connection with this question of site, is the plan of the 108th Street School, of which the picture of the exterior heads this article.

It constitutes a part of the plan of a typical school given on the next page (Fig. 16). The 108th Street School is somewhat more than half of the typical plan. At a future time the other wings will be built on the rest of the lot.

This clever plan is that which originated in Mr. Snyder's active mind and which has been worked out by him, as most available for New York schools; and it is that toward which new schools will

FIG. 15.—PLAN OF SCHOOL AT EAST BROADWAY AND HENRY STREET.

tend to conform, as far as circumstances permit. All architects will appreciate the skill with which this plan has been devised to cover the needs of the case. It is two hundred feet in its greatest dimension, that being the distance between the streets in the regularly laid out parts of New York City. In width it may be a hundred and fifty feet or more, that shown is of that width. New York city lots are twenty-five feet wide, and twenty-five feet is therefore the unit in laying out larger plots.

On each front the plan presents an ample court, large enough for a spacious paved space for a playground, and for trees and shrubbery in addition, much to the advantage of the untaught training of childhood, as all will testify whose early years have known some

elm-shaded country school grounds. Such are the silent influences that make through life dear to us—

"the schoolboy spot
We ne'er forget, though there we are forgot."

Next in importance to the general plan is the arrangement of the interior in detail. In the designing of a classroom, which is the unit of the school building, contradictory conditions prevail. The first two requirements are air and light in plenty, for which high ceilings,

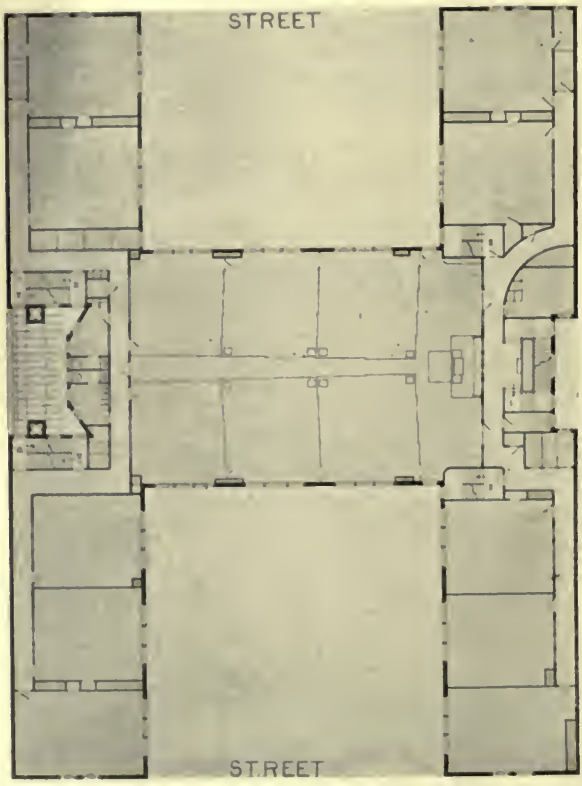


FIG. 16.—PLAN OF TYPICAL SCHOOL.

large windows, and few inhabitants are needed. The last cannot be complied with. The inhabitants of the schoolroom cannot be few. At its best, with the limitations to crowding that have been found absolutely necessary, a schoolroom is still far from sparsely populated. Forty grammar, fifty primary pupils, for a room about twenty-six by twenty-two feet, has been laid down by the New York school authorities as the greatest allowable number of pupils, which gives about thirteen square feet of floor space, and one hundred and eighty cubic feet of air space to each pupil. This is with

a ceiling fourteen feet high in the clear. That height of story has been fixed because it gives double headway, which permits the use of double stairs, a space-saving invention that is much used. The drawback to these high ceilings is that they impose much laborious stair-climbing upon both teachers and pupils.

The shape of the classroom ought to be approximately square. Oblong rooms that have windows in the long side are better lighted, yet such rooms, if of the required area, place the pupils at the far end beyond the easy reach of the teacher's voice.

On the other hand, the great cost of land of city sites, cause a pressure in the other direction, toward the elongation of the rooms

FIG. 17.—FULTON AVENUE AND 173D STREET.

away from the light, that being, of course, the way in which most rooms can be lighted from a given courtyard or street frontage.

Whatever the shape, large windows are essential: and in this was one of the chief short-comings of the old schools.

Compare, for example, the front of one of the old schools, which we have illustrated, with that above, at Fulton avenue and 173d street, or with that following, at Madison avenue and 119th street; still more with the one after that, at Henry, Catharine and Oliver street, all nearly or quite completed (Figs. 17, 18, 19).

The former two, it may be observed, are lighted by couplet and triplet windows in all the principal rooms, giving an area of per-

FIG. 18.—MADISON AVENUE AND 119TH STREET.

FIG. 19.—HENRY, OLIVER AND CATHERINE STREETS.

FIG. 20.—ST. NICHOLAS AVENUE AND 126TH STREET.

FIG. 21.—RIVINGTON AND SUFFOLK STREETS.

haps 50 per cent. of the wall to the openings. In the last-named all the windows are triplets, giving about 60 per cent. area of openings, in comparison with 25 or 30 per cent. of the old schools.

To obtain this large area of windows, the ordinary construction of buildings had to be abandoned in favor of the skeleton steel frame construction that is usual in high buildings. School buildings, indeed, are not high, in the modern sense, not more than five stories, while a building nowadays is hardly called "high" that is not over eight stories. It was not to support increased weight that steel construction was used, although all of the recent schools are much heavier than the old, the floors being made of fireproof terra

FIG. 22.—PLAYROOM OF SCHOOL AT ST. ANN'S AVENUE.

cotta blocks, supported by steel beams. But the New York building laws, for every increase in the size of windows, require a very great increase in the thickness of the walls; so great that the steel frame, costly though it is, is actually cheaper. Thus, to secure large windows, the steel frame had to be used. Below is shown the new school at 126th street and St. Nicholas avenue, and that at Rivington and Suffolk streets (Figs. 20, 21), both of which, as well as almost all of the other new schools, have skeleton steel frames.

The rear windows are also made as large as possible. Compare those of the school at Madison avenue and 119th street, built in 1894, with those seen in the Madison Street School (Fig. 1). In many of these old schools, the rear walls have been taken entirely out and rebuilt, for the sake of the large windows thus obtained.

In all of the new schools, and by new we mean those built since, let us say, 1890, or thereabouts, certain general points of construc-

tion have been insisted upon. The playrooms, which constitute the first story in all New York schools, have been built with high ceilings and large windows, making them light and cheerful as well as healthful. Such is the playroom, shown below, of the school at St. Ann's avenue (Fig. 22).

Many other points wherein the Superintendent has worked reform are suggested by this view. The bright light that is uniformly diffused throughout the room is even more striking when compared with the old schools by actual inspection than upon

FIG. 23.—EIGHT FOOT FAN BLOWER.

merely comparing this photograph with that of Fig. 5. By long exposure the recesses and dark corners of the latter, which the eye can hardly penetrate, appear in the camera as, at the worst, but gloomy; while a moment's glimpse of the former shows apparently blacker shadows than any in the other. In fact, the black shadows of the well-lighted room are really lighter than the grey obscurity of the older building.

All of these new playrooms have been paved with asphalt in place of the perishable and uncleanly board floors of the past, and asphalt is used also wherever else it properly can be used for flooring; not in classrooms, for it would be too bare and cold, but in all halls and passages, and in all wardrobes which are meant to be entered.

In the background in this same playroom is seen a set of sliding

doors. These divide the playroom into two parts when they are closed—one for boys; one for girls. They are thrown open and the whole room thrown into one on certain occasions. This provision is especially intended to permit the playroom to be used for evening lectures for which these playrooms are well adapted otherwise. Entered as they are, as nearly as possible at the street level, there are no stairs for the audience to climb, nor to impede them in case of panic. The number of entrances which are all available as exits, and the accompanying consciousness of safety within easy reach, conduce to diminish the chances of a scare to which the unbalanced emotion of the populace is especially subject.

Much thought has been given to obtaining proper materials for the schools, and many experiments have been tried. The walls of the playrooms two or three years ago were of red brick. This was durable enough, and not easily defaced with chalk or charcoal, but failed in light-reflecting qualities. Now the playrooms are wainscotted as high as a child can reach, six feet or so, with a specially made glazed brick, green or brown in color—impossible to chip, cut or write upon. Above that nothing better has been found for walls and ceilings than the whiteness of good plaster. No doubt white glazed brick for walls, and white glazed tiles for ceilings would be still better, but the cost at present forbids. The future may see school interiors of white glazed clay materials, and white mosaic floors of marble or porcelain, and look in a superior way at our best efforts as we do at the brown painted boards that were the best our ancestors could do.

Still dwelling on the same playroom photograph, there is seen above on the ceiling a curious-looking boxed-in affair dependent. This is the main air duct for ventilation, through which is drawn the fresh air supply to be warmed and forced to the rooms in the stories above. The plans of schools previously given show the square pipes through which the air is carried upward.

In all of the larger schools, those of perhaps twenty classrooms or more, a blowing apparatus is used to furnish the fresh air to the classrooms. The same results might be obtained by heating the exhaust flues, but it is well established in scientific ventilation that a pound of coal will move more air by mechanical power, than by merely warming it. The fans are placed in the cellars. One of them is shown in Fig. 23; a big fellow it is, an eight-foot wheel, the janitor, who is also the engineer, calls it. In the smaller schools the cost of the mechanical apparatus prohibits its use, and the air is moved, less advantageously, by heat directly applied. Even when blowers are used the air must be warmed before it is forced through the building. Besides the supply of warm air, additional heat is needed in cold weather: for this direct steam radiators are used, placed in the classrooms as required.

Steam, by one method or another of use, has been found the most available means of heating. Hot water has been tried in one case, that of the school at Ninth street and First avenue.

For some of the smaller schools hot air furnaces are used, indeed there are so many points to be considered in adopting a system of heating and ventilation that each school must be studied separately.

The perfect system, no doubt, is that of mechanical distribution, but in practice it must sometimes give place to other methods.

FIG. 24.—GYMNASIUM.

The question of artificial lighting is a difficult one. Ordinary school work needs none, but for evening school sessions, such as are held in many city schools, and for evening lectures, which are more and more demanded, artificial light is required. Gas is commonly used, but is far from satisfactory, as the products of combustion foul the air. Electricity is better in this respect, and is being substituted, as rapidly as funds permit, for gas, in all evening schools, especially in the old buildings—in the new buildings it is generally introduced.

Some schools have been fitted up with dynamos and electric plant of their own, as an experiment, of which the advantages are already seen.

The St. Ann's Avenue School, finished in 1897, like so

FIG. 25.—CARPENTER SHOP.

FIG. 26.—COOKING ROOM.

FIG. 27.—HESTER AND ORCHARD STREETS.

FIG. 28.—WEST 77TH STREET.

many of the newer schools before shown, has a story in the pitched roof, above the regulation four stories below. Four stories are the rule, the first for the playrooms where the children rendezvous; the second for the smallest children, next to the tiny kindergarten pupils; the third for children of intermediate size; the fourth for the largest, upon the entirely reasonable principle, that the bigger they are the higher they are able to climb. But wherever a fifth story is seen it is devoted to the department of

FIG. 29 —EXTERIOR CARVING.

manual and physical training, to keep pace with the new lights that have blazed for us in these latter days in educational matters.

And it must be confessed that an inside view quite justifies the doctrines of the new lights.

Gymnasiums there are, and carpenter shops, cooking rooms, or culinary departments, in the magniloquent official nomenclature, and sewing rooms and modelling rooms, all quite fascinating to the mind of the visitor, with the intense interest that doing has, above thought, for almost everybody.

Look at this gymnasium for a specimen (Fig. 24), with its trapeze rings and climbing rope hanging from the ceiling, its parallel and horizontal bars, and leaping hurdles and mattresses on the floor.

Or at this carpenter shop, with its strong benches, and vises and closets full of polished tools, enough to attract anybody (Fig. 25).

Here again is the cooking-room, just across the hall (Fig. 26), with its gas ranges, and polished "batterie de cuisine," where the only difficulty might be to impress the pupils that the processes shown were practicable with their own black and solitary saucepans.

The very latest idea in school building, and an eminently reasonable and satisfying idea it is too, is to provide a playground on the top of the buildings, to supplement those in the yards below and to save the long travel to the first story for the pupils in the fourth and fifth stories.

FIG. 30 —STAIRCASE.

Two photographs of the most recent schools, one at Hester and Orchard streets, the other at 77th street, hardly yet completed are Figs. 27, 28.

In all of these, the high parapet above the cornice marks the existence of the roof playground behind it. In two of them, if you look closely, may be seen some indication of the wire mesh-work with which the whole roof playground, top as well as sides, is enclosed. Nothing less was deemed sufficient to ensure the safety of the more aspiring spirits of the East Side boys, who would scale any mere fence, however high.

Space fails to describe the innumerable evidences of careful thought that are observable everywhere—the snow-melting apparatus, heated by steam, into which the snow on the roofs may be quickly shovelled and disposed of—the white tile enclosed stairways—the catch-basins in the yard pavement, a special invention that cannot be plugged with paper or anything else by the cleverest infant mind.

With all this the architecture of the buildings has not been neglected, for as education ceases to be conducted by factory methods it is well that the walls where education dwells should signalize the change by forsaking their factory appearance.

In addition to the general designs, two scraps of detail, one of a main stairs, one of exterior carving are given, neither of them even the best of their kind in the schools, but the best just now obtainable.

The coloring of the newer schools is most happily confined to the greys and browns, and sometimes lighter cream tints of stone or modern brick.

Red brick, however artistic when set in greenery, is not at its best when set in the interminable red brick of a city; the eye welcomes a quieter color.

With all this, the cost of the newer fireproof buildings, by figures accessible to all but too dry to recount here, are actually less in cost per pupil than the far inferior and combustible buildings of past years.

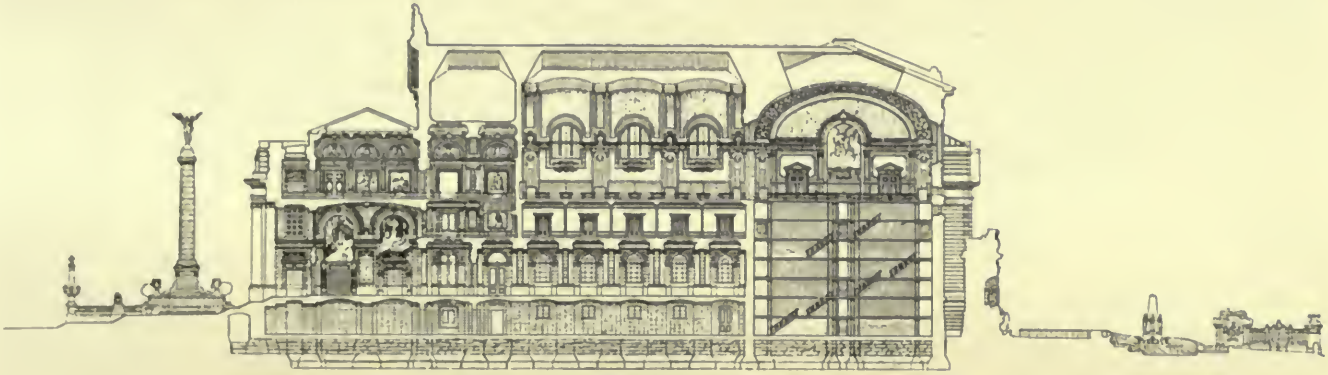
John Beverley Robinson.

VILLAGE SCHOOL AT THROGG'S NECK.

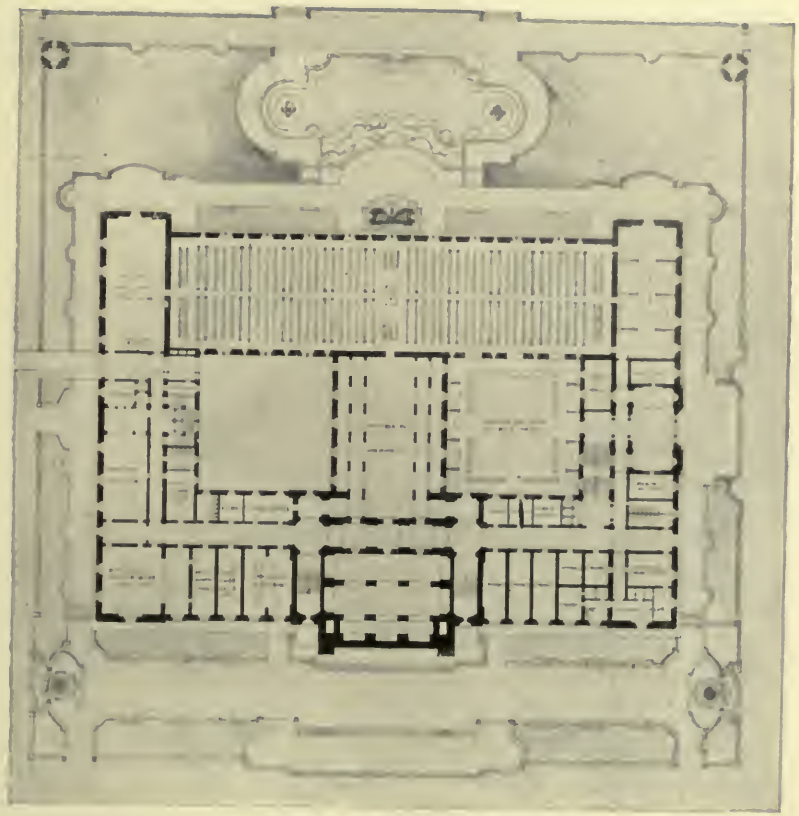
NEW YORK PUBLIC LIBRARY.

Fifth Avenue Elevation.

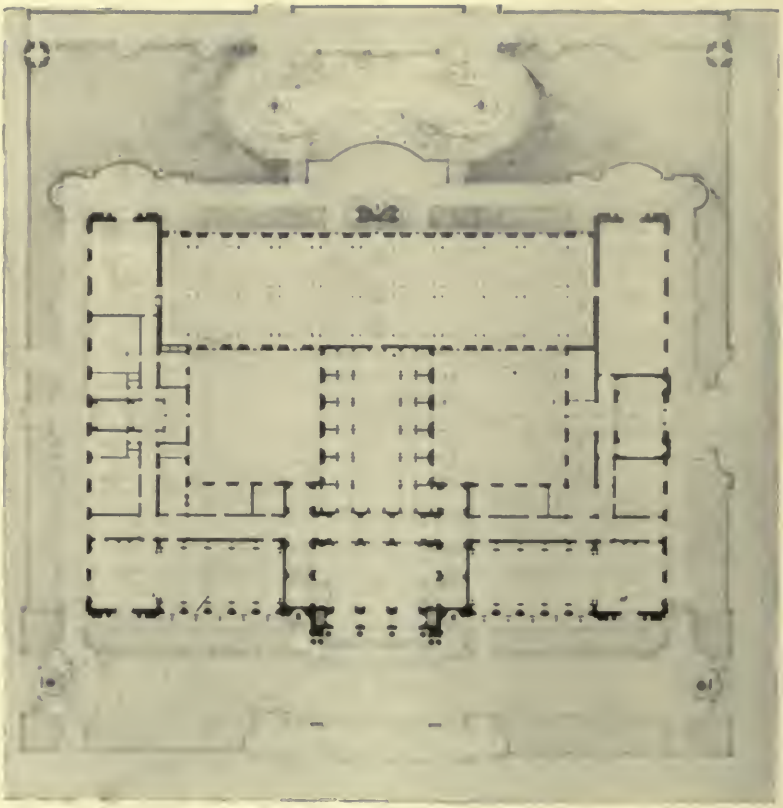
Carrère & Hastings Architects.



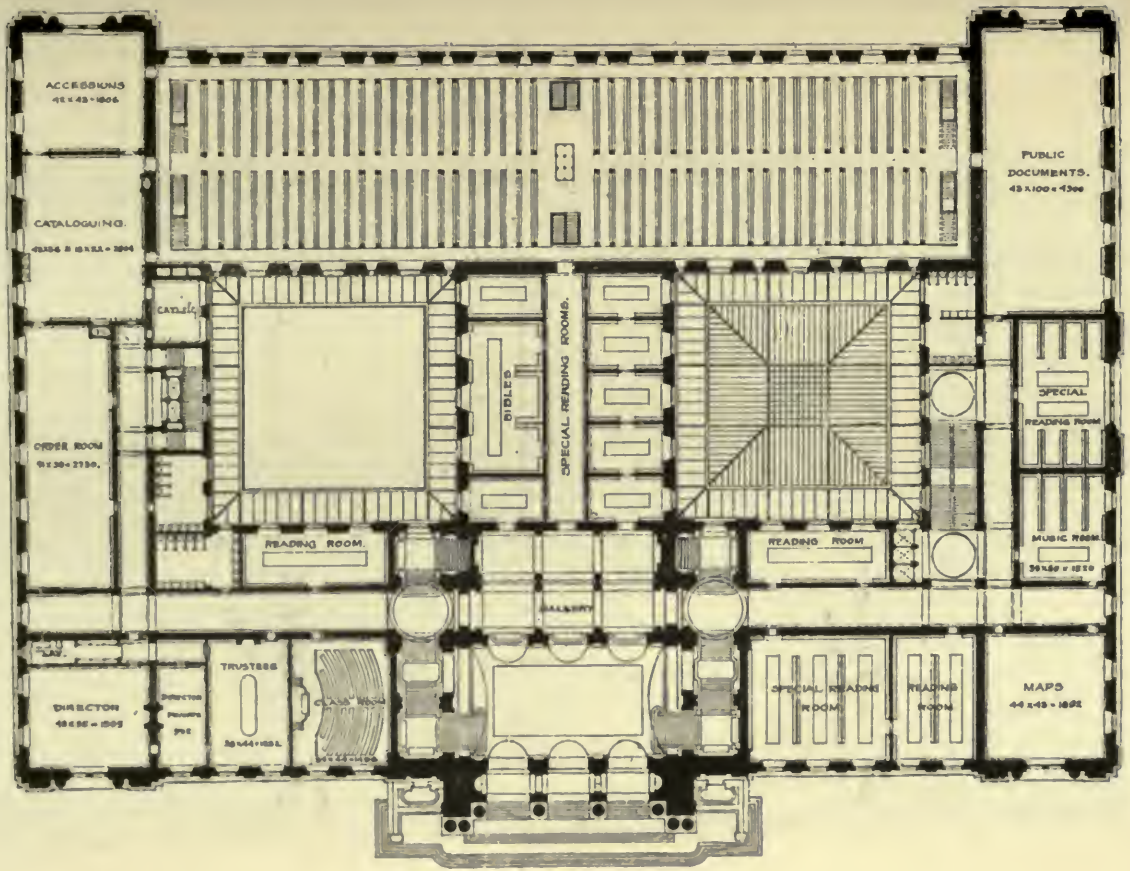
NEW YORK PUBLIC LIBRARY.
LONGITUDINAL PLAN.



NEW YORK PUBLIC LIBRARY.
BASEMENT FLOOR PLAN.



NEW YORK PUBLIC LIBRARY.
FIRST FLOOR PLAN



NEW YORK PUBLIC LIBRARY.
SECOND FLOOR PLAN.

THE NEW NATIONAL ACADEMY OF DESIGN.

New York City.

Carrère & Hastings, Architects.

THE MUSEUM, NANTES, FRANCE.
Cl. Josso, Architect.

INTERIOR. Botson, Mass.

FAILURE AND EFFICIENCY IN FIRE-PROOF CONSTRUCTION.

THE widespread interest that has recently been developed in fire-proof construction is no surprise to those who have made a careful study of the subject. The enormous fire loss, so faithfully tabulated and published annually, has for years been a mute but significant object lesson, representing, as it does, a large portion of human effort that is irretrievably lost.

Until very recently, fire-proofing methods in this country, contemplated the use of the burnt clay products solely. Manufacturers of that material have varied the forms and devised new methods of applying it, but the merits of the so-called improvements have never been established by practical tests. The fire tests made in Denver, Colorado, in December, 1890, so often quoted in trade publications, and which for years satisfied the public mind as to the efficiency of the burnt clay products, were conducted without any facilities for recording accurate temperatures and, like many other tests of later date, were so crude and unscientific in their character as to be absolutely valueless.

It is to be regretted that architects, as a class, have given so little thought and study to so important a feature of modern building construction. Absorbed in the more artistic details of their work, they almost invariably consign the problem of fire-proof construction to the care of a subordinate whose facilities for investigation and study are usually very limited, and who wisely adheres to the usual and established practice, however faulty or questionable that may be.

Burnt clay "fire-proofing" has been installed in buildings in this country very extensively since 1889, without any definite knowledge either as to the actual fire and water resisting properties of the material or the best methods of employing it. What is the result of groping about in such ignorance? The answer is to be found in such fires as occurred in the Temple Court and Manhattan Savings Bank buildings of this city; in the Athletic Club building of Chicago, and in the Horne store building of Pittsburg. These are only a few of many instances in which the efficiency of burnt clay fire-proofing has been found wanting, and they serve to indicate how imperfectly the art of fire-proof construction is understood. In cases where recognized or standard methods of fire-proofing have either wholly or partially failed, it has been customary to criticise the methods employed or the workmanship, and failing to account for all of the phenomena in this manner, to enshroud the facts in the mysterious atmosphere

of the unaccountable. Even so eminent an authority on insurance matters as the well-known manager of the New York Tariff Association, confesses his inability to account satisfactorily for some of these phenomena. One set of floor arches, he says, will soon fall out completely, while another, apparently similar, will resist a fierce and protracted conflagration without losing anything in strength. The solution of many of these perplexing problems is undoubtedly to be found in the temperature of the fires to which the material was subjected.

The recent fire and water tests of fire-proof floors, made by the Department of Buildings of New York City, were the most elaborate and instructive that have ever been made in public in this country. These tests brought out clearly what was not generally known prior to that time—that Portland cement concrete is an excellent fire and water resisting material, and, as such, is superior to the burnt clay products. In this connection it may be interesting to note that as long as eight years ago the linings of the Dietzsch cement kiln were changed from magnesian fire clay brick (a vastly more refractory material than the ordinary burnt fireclay fire-proofing) to Portland cement concrete. In the manufacture of Portland cement temperatures of 2,600° to 3,000° Fahr., are obtained, and considerable difficulty was experienced on account of the melting of the burnt clay linings, which, when fused, became attached to the charge in the throat of the kiln. This difficulty was remedied by substituting a Portland cement concrete lining, which has since been in use. (See Ciments et chaux Hydrauliques, by Candlot, page 55.)

The greater portion of the burnt clay fire-proofing is manufactured at temperatures varying from 2,000° to 2,300° Fahrenheit. When in actual fires or tests, the temperature is reached at which the material was manufactured, the surfaces exposed to the heat become soft, then plastic and if the temperature is maintained, the construction weakens until it fails. This was substantially what occurred in the case of the end-construction hard-burned clay arch which was tested side by side with a Portland cement concrete arch at 68th street and Avenue A, New York City, on Nov. 19, 1897.

Careful inquiry and observation extending over a considerable period of time justify the belief that temperatures of 1,900° to 2,250° Fahrenheit are frequently developed in actual conflagrations. This opinion is based on the fact that copper wire has been fused in a number of instances representing a temperature of about 2,000° Fahrenheit. In exposed positions, where the conditions were favorable to produce high temperatures, such as, for example, in the neighborhood of elevator shafts, stairway wells, etc., cast iron of light section and the edges of heavy castings have also been fused. These phenomena represent probable temperatures of 2,100° to 2,350° Fahrenheit.

The Building Department tests were all made in structures of common brick. Careful observers who witnessed the tests of the Roebling system and other concrete constructions, could not fail to note that large areas of the interior surfaces of the brick walls, which had been subjected to the same temperatures as the concrete flooring, had fused and turned black, the fused material having reached such a consistency that in some places it slid down, while in other places it still hung to the walls in irregular masses, varying in size from a small nut to an egg. Although temperatures of 2,450° Fahrenheit were obtained in these tests, no indication of fusing was observed on the exposed surface of the concrete arches. In the face of such conclusive evidence as to the inferiority of common brick as a fire-proofing material, is it not singular that one of the leading architects of New York City should adopt the ordinary "row-lock" brick arch construction for the new Hall of Records Building?

In order that a material may be fire-proof in the broad sense in which that term is now used, it is not only necessary that it shall successfully withstand the highest temperatures that are ever obtained in actual conflagrations, but it must also retain its strength and resist disintegration when suddenly cooled by a regulation fire stream. In addition to these requirements, it is desirable that the material shall be inexpensive, light, and that it shall not discolor plaster work.

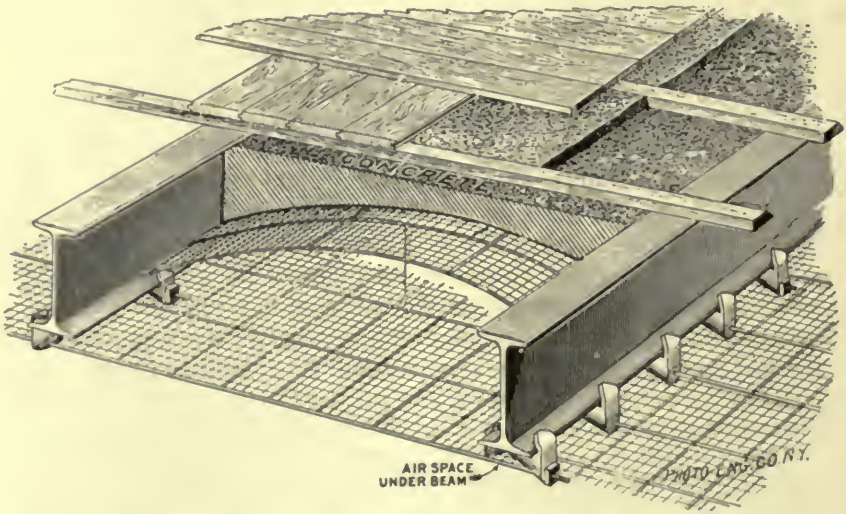
The more or less unsatisfactory manner in which the burnt clay materials fulfill the foregoing requirements, and the lack of any precise knowledge on the subject of fire-proof construction, induced one of the largest engineering and manufacturing concerns of this country, five years ago, to undertake a careful investigation of the subject. Elaborate tests, under the supervision of competent engineers, involving the expenditure of large sums of money, established the fact that concrete made from "cinder" (the residue of anthracite coal consumed in boilers), sand, and good Portland cement, fulfilled the requirements in a more satisfactory degree than any other material tested. The best and most economical method of employing the material was next considered. This subject was, for the first time, studied from a scientific standpoint and was treated exactly as any other engineering problem. Arches consisting of a number of assembled parts, either flat or segmental, were objectionable on account of the thrust and the consequent liability to settle and crack the plaster. Flat slab construction was not desirable because it developed little more than half the available strength of the material. This fact will be evident when it is explained that (a) cinder concrete is very much stronger in compression than in tension, and (b) the flat slab construction acts as a beam with the upper half of the section in compression and the lower half in tension. It is, of course, well known that the strength of a concrete slab can be very greatly increased by imbedding metal in the tension member of the section, but as that is usually the under side of the slab, it was evident (as was also subsequently shown by tests) that a hot fire would soon seriously

impair or totally destroy the strength of the metal and render it valueless as an element of the construction.

A monolithic construction in the form of a segmental arch was finally found to be the most economical and the best adapted for spanning the interval between the iron beams. In this form of construction the material is disposed so that the entire section is in compression, thus securing the maximum strength and lightness independently of metallic elements in the construction.

More important, however, than any other detail in fire-proofing a steel skeleton building is the protection of the structural iron. The massing of the fire-proofing material around the iron beams, which is so admirably realized in the monolithic segmental arch construction, secures the greatest possible protection with the available material.

Economy requires that the fire-proofing, like many other features of modern building construction, must be adapted to special requirements. These vary considerably and depend upon the character of the building. For hotels, apartment houses, office buildings, residences, etc., where the combustible material consists principally of interior finish, furniture, etc., the construction illustrated by Fig. 1



affords ample protection for the iron work, is economical in space and cost, and is especially adapted for the finest plaster finish. Plaster applied to this ceiling construction never sags or cracks and *never discolors*. These are important *desiderata* that are appreciated by architects who contemplate expensive fresco work and other elaborate ornamentation. The advantage of the continuous air space between the floor and ceiling, especially in buildings that are subdivided into a number of small rooms, has been fully established and is here properly and successfully employed.

That this construction affords ample protection against fire, was conclusively shown in the public fire and water test conducted by the New York Building Department at 81st street and West End avenue, New York City, on September 3, 1896. The duration of the fire

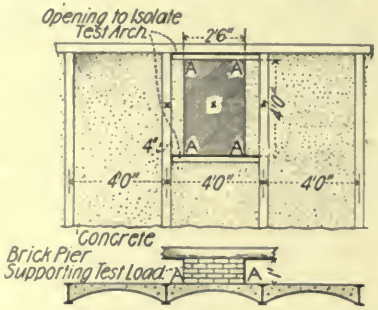
test was about two hours, during which a maximum temperature of 2,400° Fahrenheit was obtained and an average temperature of 2,100° maintained for over an hour. The fires were quenched and the ceiling cooled by a regulation fire stream under 60 pounds pressure. Little or no damage was caused by the fire, but the water from the fire engine washed nearly all the plaster from the ceiling. As to the condition of the floor and ceiling after the test the official report of the Superintendent of Buildings reads: "the wire in the ceiling was intact and the arches did not seem to be damaged in any way." The deflection of the iron beams after cooling was found to be less than one-fourth of an inch in a span of sixteen feet. The test indicates also the extent of the damage that may be expected from as severe a conflagration as is ever likely to occur in a hotel or office building in which this construction is used. The expense of the repairs, as shown, would be confined to renewing the wood finish and restoring the plaster.

At the request of the Superintendent of Buildings, the same construction was subjected on October 28, 1896, to a five-hour fire-test, which was intended to represent an extreme case of conflagration, such as might occur in a warehouse filled with inflammable materials. The very successful result of the latter test is thus described in the official report: "The arches were in good condition. South arch steel segment rods displaced. The concrete arch proper seemed not to be affected in any way by the fire and water," etc. When it is further noted that the flat ceiling construction was omitted under the south arch referred to, and that the steel-ribbed wire centering and concrete were exposed without even plaster protection to the direct action of the flames, the above results cannot fail to prove the wonderful fire and water resisting properties of cinder concrete. The plaster and light steel flat ceiling construction under the other arches in this test remained intact for 4¾ hours, when the lacing wires having fused the wire lath and plaster fell away from the supports. In an extraordinarily severe conflagration the expense of repairing the damage as given in the case of the first test might, therefore, be slightly increased by the renewal of the light ceiling construction at such points where excessively high temperatures may be developed.

For warehouses, where great strength and economy in space and cost are desired, and for any building which may become the repository of large quantities of inflammable goods, the form of construction illustrated by Fig. 2 is recommended. The cost is considerably

reduced by dispensing with the flat ceiling, while the soffits of the beams are protected with three inches of concrete. The concrete underneath the beam being filled in at the same time as that in the arch work, insures a solid monolithic construction completely encas-

ing the iron work, and thus protects it more effectively than by any other method in use at the present time. As illustrating the adaptability of this system to warehouse construction, it may be interesting to review a strength test of a four-foot section of one of the floor arches that had withstood the five-hour fire and water test of October 28, 1896. The test was also made under the supervision of the New York Building Department. The position of the load on the arch is clearly shown by the shaded area in Fig. 3. After "shoring up" the iron beams the load sustained by the arch is officially given as follows: "Brick 38,000 pounds; stone, 2,000 pounds; planking, 550 pounds; 3 men, 450 pounds; total 41,000 pounds, distributed over an area of 10 square feet = 4,100 pounds per square foot." The arch deflected three-quarters of an inch, which was partially recovered after the removal of the load



Other modifications of this system are equally well adapted to public buildings, banks, libraries, department stores, theatres, halls of records, etc. The same system embraces also several meritorious forms of fire-proof partitions, and new and ingenious methods of suspending ceilings, furring for ornamental plaster effects, etc.

Substantial proof that the merits of this system are rapidly being recognized, is the fact that the lowest rate of insurance ever allowed on a fire-proof building in New York City, has been written for one of the large office buildings in which this system of fire-proofing has been installed.

There are also many advantages in erecting this construction that will appeal to the practical architect and builder. The material being dumped and mixed in the cellar as needed, bulky piles of material are conveniently dispensed with. The permanent wire centering erected alway in advance of the concreting, enables the work to progress continuously. It also acts as a safeguard, having saved the lives of many workmen who have fallen on it from aloft. The practical details of erecting the work have been reduced to a system insuring the greatest rapidity as well as the best results. All fire-proof construction erected according to this system, including the concrete, is furnished by the John A. Roebling's Sons Company, and is fully guaranteed. The responsibility and business reputation of this company enables it to undertake the largest contracts and fulfill all its obligations to the entire satisfaction of architects and general contractors.

The architect who desires to secure for his client the best and most economical construction, and who cannot devote the necessary time and expense to thoroughly study and investigate the subject of fire-proofing, will do well to discriminate against inferior materials and those constructions that are largely in the experimental state, or which contain elements of questionable utility when subjected to the crucial test, and adopt that which has been tested and tried and found to meet the most searching and exacting requirements.

CONVENIENCE AND SANITATION IN SCHOOL CONSTRUCTION.

THE first consideration in the erection of school buildings is, and must always be, perfect sanitation—the second, economy in construction. The utilization, therefore, of such appliances as effect a saving of floor space (for economy in area certainly means economy in construction), and are at the same time superior from a sanitary standpoint, is of the most intense interest to architects and school authorities.

In this connection, the adoption by one city alone of over two hundred ventilated wardrobes, made by the Flexible Door and Shutter Company, is significant.

It has been a difficult matter to devise ways and means for the proper ventilation of the clothing of pupils, the lack of which ventilation is so often the cause of the spread of contagious diseases, and to properly air and dry the outer garments during the school session; a solution of the problem seems, however, to be presented by this interesting device.

The wardrobe, 15 feet long by 2 feet 3 inches deep, placed in a school hallway against the wall provides ample cloak room for 56 pupils. A strong wire screen, attached to a framework, to which shelves and hooks are secured, provides an air space 4 or 5 inches deep at the back; near the middle of this air chamber, or at one end is an opening in the wall of sufficient area to connect with the nearest ventilating flue. The heat from the steam risers, placed back of the screen in the wardrobe, draws the air from the hallways in and through the wardrobes, at the same time airing, warming and drying the clothing in cold or wet weather. Economy of space is an important feature in this new convenience, saving the floor areas usually taken up by cloak rooms, thereby lessening materially the cost of construction. In practical use the ventilated wardrobe has now fully demonstrated all the strong features claimed for it and has received the indorsement and support of authorities in school construction wherever they are in use. Of their practicability Principal Frank L. Greene, of Brooklyn Grammar School No. 9, writes:

"The twelve (12) Ventilating Wardrobes closed with Flexifold doors in daily use in P. S. No. 9, this city, continue to give good satisfaction and effect a marked saving in floor areas and do away with the usual cloak rooms.

"The ventilating scheme is simple and effective, and in use, with the aid of monitors, we find them convenient."

The use of the flexifold door in the construction of the ventilating wardrobe is only one of the many applications of the flexifold partition. By the use of the same principle of construction the Flexible Door & Shutter Company have succeeded in making a partition capable of closing even the largest openings. Such an one is used to divide the Assembly Hall in the Catholic Institute at Valley Falls, R. I. Its dimensions are 48 feet wide by 11 feet 6 inches in height.

It will be easily seen how not only is convenience catered to by the device, but how also a marked saving of heat is effected. These vertical rolling partitions, operated without springs or weights, are constructed of wood moulding 1½ inches wide, hinged together with a continuous and wholly concealed interlocking steel connection, so devised and inserted into and through the wood moulding as to make the door or partition vertically rigid, while their simplicity permits the entire door or partition to be easily taken apart and put together again in case of injury or accident. In operation an even action is obtained, impossible to any vertical partition operated by springs. A simple gear that engages with cog pins on the top of the mouldings and is connected with a helical reel makes the tension even at all points, giving a smooth running action to all widths of doors.

For the subdivision of large assembly rooms in school buildings into recitation rooms, or for the subdivision of lecture or class rooms in Sunday schools as occasion may require, economizing floor areas and obviating the necessity of heating the unused portions of such large spaces, such partitions come into strong favor, while the fact that they are practically sound proof adds to their practicability for this use. Their adoption by architects, as well as church and school authorities and the excellent service they are already doing in hundreds of modern buildings in all sections of the United States, subdividing or filling wider openings than ever before attempted, attests the superiority of their principle and construction. The offices of this company are at 74 Fifth avenue, New York City. Their factories are at Bloomsburg, Pa.