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TEMPERAMENTAL ARCHITECTURE

IN THE CATHEDRAL CHURCH OF ST. JOHN THE DIVINE, NEW YORK

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AN appropriate occasion is offered by the recent dedication of the Cathedral of St. John the Divine for the consideration of certain architectural refinements which are used in the choir and which were suggested by mediæval precedents; thus reviving principles which found very widespread application in the old cathedrals. Mr. C. Grant LaFarge has already touched upon this matter in the article contributed to Scribner's Magazine in April, 1907.

The fact certainly merits all the prominence and emphasis which can be given to it, that the choir of this cathedral has an asymmetric plan, that its arches and pier spacings are asymmetric, and that its pavement is built to slope upward toward the eastern end of the church. The firm of Heins & LaFarge was thus the first in modern times to revive those intentional asymmetries of dimension and plan which are so frequently found in mediæval architecture.

With the exception of another and earlier asymmetric plan (at Methuen, Mass.), by the same firm, St. John the Divine appears to be the first instance of a modern revival of mediæval constructive asymmetry.

This fact has additional interest because Mr. Heins has formally announced and explained his own point of view on the subject of "refinements" in the article under that title which he contributed to the Sturgis-Macmillan *Dictionary of Architecture* and because further matter on the same subject may be quoted from a personal letter which he wrote only a few months before his lamented death.

The circumstances under which this letter was addressed to me, in 1907, may be first mentioned. It may have been about 1898, and during, or soon after, the appearance of my series of articles on the subject, that Mr. Heins first made known to me that his firm would introduce refinements in the choir of the Cathedral, and it was a little later that the original manuscript of his article for the Sturgis Dictionary was confided to me. This manuscript was of very much greater length than Mr. Sturgis had been able to publish in the Dictionary. Meantime it was understood between Mr. Heins and myself that the firm did not care to have public mention made of the use of refinements in the choir until it was actually built.

In 1907 the choir was so far finished that this temporary restriction on public mention was withdrawn. I was then making plans for a book which is still unwritten and, with this book in view, asked Mr. Heins to furnish for this publication his own account of his reasons for introducing the asymmetries of construction. Some passages from his reply

follow here and it will be observed that one of them includes the permission to publish an account of the choir:

"Lake Edward, P. Q., May 28th, 1907.

Dear Mr. Goodyear:

Your note came just as I was in the final agony of breaking loose for a couple of weeks in the woods, which is my apology for not having answered at once. I hope this will be in time * * *. The way all these refinements appeal to me is the way the woods appeal to me. If the trees were all alike I should be tired of it in an hour—just as much as one would tire of living in a street where the houses are "built in a row." It is unnatural to make things all alike and I do not like them so, but cannot give it a name. It seems as though we had become so accustomed to machine-made repetition as to find it difficult to express repugnance for the system—just as it is said that if a man is imprisoned long enough he will object to being set free—the idea of having to make a choice on his own initiative becomes terrifying. I can only say that the idea of modulation and refinement seems to me covered by the word 'art' and artistic, but I have no word in my vocabulary to express the antithesis, except to say that such things are ugly and unpleasant and repellent. We have words to express both sides in other things; good, bad; true, false; hot, cold; but art, ?, what?

I maintain that refinements and modulations belong in the domain of art, though they are not all of it. *They are indispensable to a building that shall continue to please people of discernment for centuries after its erection. In other words they are indispensable to a work of art.**

Do not hesitate to publish whatever you determined upon with Mr. LaFarge. Our hesitation was only of temporary quality, as you understand. Yours very truly,

G. L. Heins."

Before quoting from the general views of Mr. Heins about refinements, as further expressed in his contribution to the Sturgis Dictionary, it may be well to describe a little more closely the special nature of these refinements in St. John the Divine.

The pavement of the choir has a rising slope toward the east of six inches. The arches are of discrepant sizes, with variations in the heights of the capitals. There are also variations in the spacings of the piers. The lines of the piers converge in plan toward the east, to the amount of 19 inches in 57 feet. They diverge, to a corresponding extent, from the outer walls. To quote the exact words of Mr. LaFarge in the Scribner article: "It is with the desire to avoid to some extent the banal aspect of mechanical regularity that certain refinements are practiced in the Cathedral. The choir arcades are not parallel, but converge slightly. Their springings are not level; the spacings of the arches of choir and ambulatory are unequal; the floor slopes upwards to the east and the great columns are unequally spaced."

Mr. LaFarge has also quite recently furnished me with the following statements:

"Taking first the high arches which are in pairs at either side of the choir, the western arch has a radius of 10′ 6″ and the eastern arch a radius of 10′ 0″. The caps from which these arches spring, taking the western cap as zero, lift as they go east, the middle cap being up 18″ and the eastern cap 3′ 0″. This last level is then carried around for all the arches springing from the great columns of the apse.

Taking next the lower arcades under the organ galleries, these being on each side in two pairs, each pair coming under the single high arch, and counting from east to west, the radii are as follows:

First arch, 4′ 7″; Second arch, 4′ 10″; Third arch, 4′ 6″; Fourth arch, 4′ 4″.

The caps engaged in the piers from which these arches spring are all on a level, but the caps of the free-standing piers which occur at the meeting of each pair of arches are up 6″.

Any variation from these figures would be very slight, and would not be important."

Mr. LaFarge adds to these figures others for the arches, still to be built, opening from the great crossing into the (unbuilt) transepts and into the (unbuilt) nave.

"As designed, the present, or eastern arch, which opens from the crossing into the choir, springs from a level 16 feet higher than the arches opening into the transepts, and 25′ 6″ higher than the western arch at the nave; that is to say that, starting from the east end of the nave, the transept springing lifts 9′ 6″, and the choir springing 16′ 0″ above that.

I personally consider this, as did my late partner, one of the very finest elements in the whole design of the interior.

My belief about it, and my reasons for it, are clearly set forth in my article which was printed in Scribner's magazine of April, 1907."

*Italics by W. H. G.

The lifting of the effect of the choir by these successive rises has precedents in S. Paolo Ripa d'Arno at Pisa and in the Cathedral of Monreale. In the first-named church, which is comparatively a small one (145 feet long), the last bays of the nave rise above the preceding ones 2.22 feet, south side, and 1.23 feet, north side, while the transept arches are from 12 to 14 feet higher.

The widths of the same bays of the nave increase 7½ feet, south side, and 7 feet, north side (from 16.20 to 23.76, south; from 16.38 to 23.33, north), thus approximating closely to the width of the transepts, which is 24 feet.

The changes of width and height are not noticeable (for which parallel cases will be mentioned later) and as regards the height the effect is one, not only of uplift, but of smooth transition and avoidance of abrupt contrast.*

As regards Monreale, Mr. LaFarge's own words in the Scribner article may be quoted: "The richness of decoration is so striking that we are quite likely to lose sight of one of its most remarkable qualities, the singular majesty of effect, due in no small measure, it is true, to the arrangement and scale of

*The measurements for S. Paolo Ripa d'Arno have never been previously published.

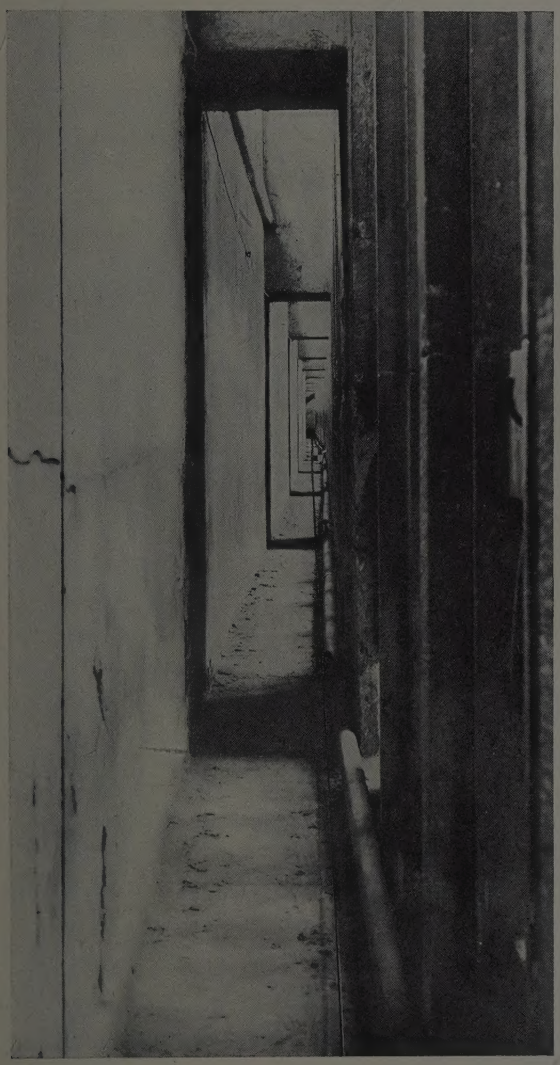


FIG. 1. ST. OUEN, ROUEN
SOUTH TRIFORIUM, LOOKING WEST

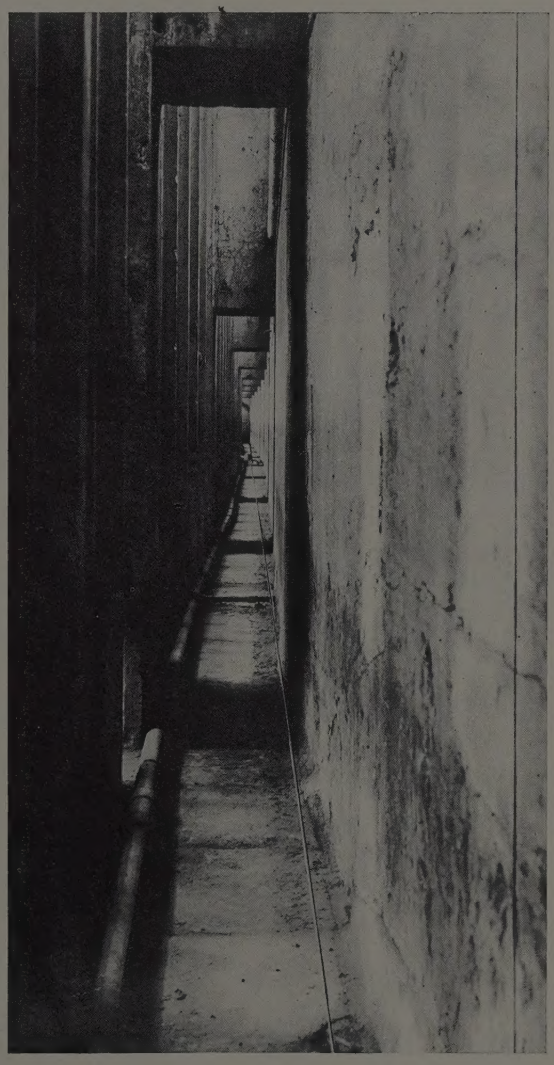


FIG. 2. ST. OUEN, ROUEN
NORTH TRIFORIUM, LOOKING WEST

its mosaics, but even more to the bold subtlety with which the succeeding arches rise one after another, to the springing of the half dome of the sanctuary in which is the colossal mosaic bust of Christ."

In spite of the large amounts of the variations in the unbuilt part of St. John the Divine just quoted by Mr. LaFarge, it may be confidently said that the eye will note the effect without noticing the means by which it is produced.

Lest visitors to the church should anticipate the possibility of easily detecting the variations in the completed choir, it may be said that the pavement of Santa Maria Ara Coeli on the Capitol Hill at Rome, a church which is well known to every tourist, has a rising slope of 2.90 feet between entrance and choir rail, which will probably never have been noticed by any one who reads this paper. Few architects who read this paper will have noticed a rising slope, at Chartres, of three feet seven inches, between entrance and choir rail. Instances in Italy might be multiplied indefinitely, but it is sufficient to say that the Brooklyn Museum research has records for levels of pavements with a rising slope toward the choir, in eighty-five Italian churches, and observations for a much larger number, although no history of architecture has ever mentioned a single instance of this constantly recurring arrangement in mediæval churches.

The slope in St. John the Divine will, therefore, certainly not attract attention, although the levelling of the floor of the choir stalls resting on the slope makes it more apparent than it would be otherwise.

As to noticing a convergence in plan of 19 inches in the alignment of the piers, it may be mentioned that a convergence of seventeen feet in the walls of S. Giorgio in Velabro at Rome, or of twenty-three feet in S. Stefano at Venice, is absolutely inconspicuous.*

In fact, Mr. Street's *Brick and Marble in the Middle Ages* quotes a uniform width for the nave of S. Stefano of "about 48 feet," without noticing that the nave narrows in plan 16 feet, to correspond with the walls. This measure must have been taken at the second bay of the nave, on the presumption which is usual in modern surveys, that one measure is sufficient.

As to the varying heights of the capitals in St. John the Divine, Mr. Heins is himself authority for the point that this variation is wholly inconspicuous.

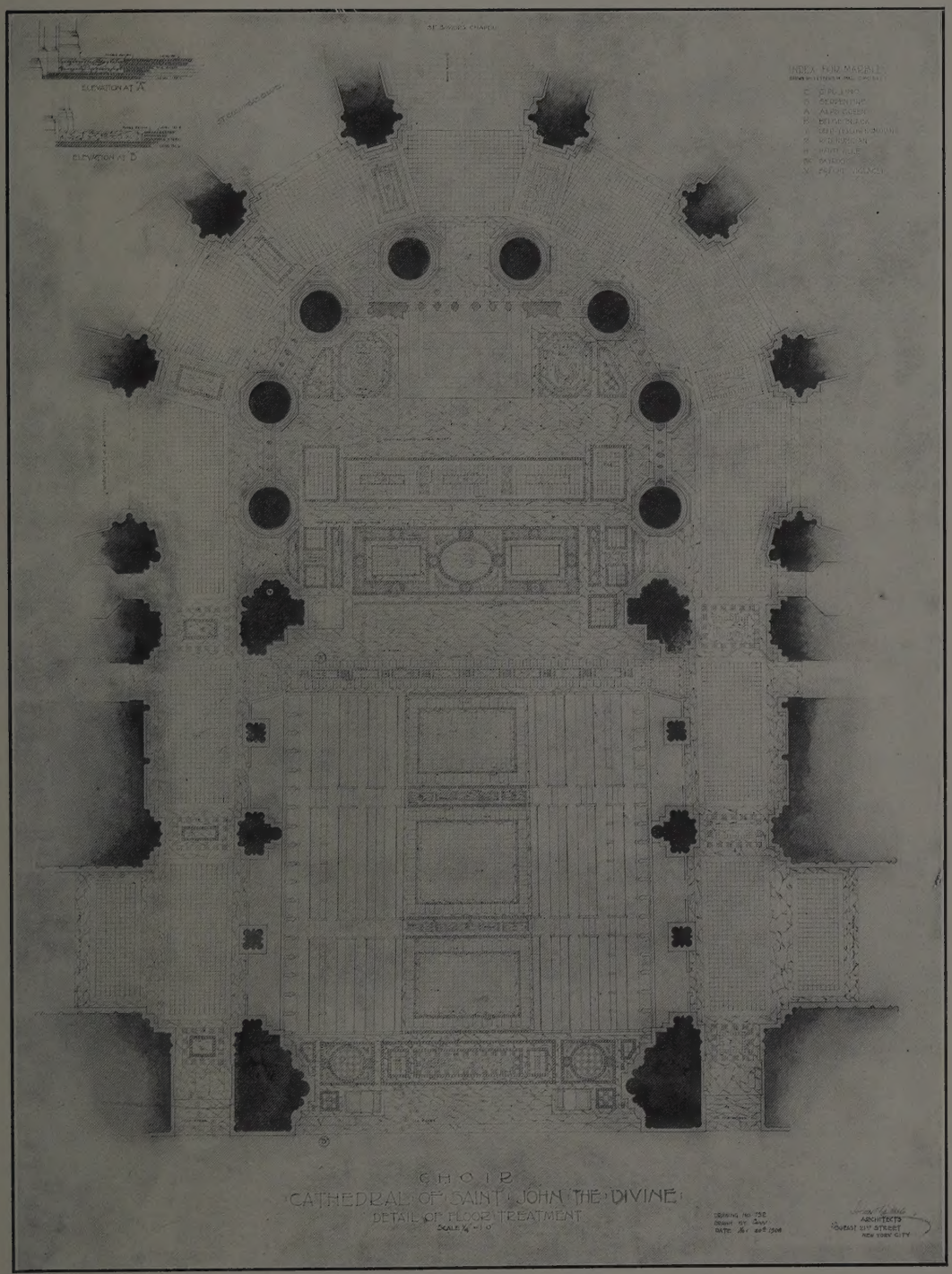
In one passage of the quoted letter he says: "I am constantly surprised to find that it is almost impossible to see that there is any variation in level of the caps from the choir floor; it is readily observable from the gallery level." On this head it may be added that variations which aggregate a maximum of three feet in the height of arches in Fiesole Cathedral are almost universally overlooked. To say nothing of foreigners, hundreds of Italian antiquarians are wholly ignorant of the existence of these and similar discrepancies, such as the drop of five feet in the eastern crossing arch of Siena Cathedral. (During a recent visit to Florence a friend who was with me in S. Maria Novella, and who knew from my publications that this church has variations in pier spacings aggregating a maximum of thirteen feet, undertook to point out the widest arch. He selected the wrong one, but I could not be certain of his error, until I had applied the tape.)

Thus it appears that the architects of the most imposing church in America have taken the trouble to give variations to the dimensions which they cannot themselves detect from the floor of the church.

In his conversations with me Mr. Heins always insisted on the point that his firm would have gone much farther in the use of refinements in this cathedral, if the conditions of modern practice, the novelty of the idea, and the traditional habits of modern masons had made it possible or convenient to do so. That he was fearful of arousing prejudice by premature announcement of his plans before they had been executed may be stated, and that he was led to proceed cautiously by the consciousness that such a prejudice existed is also positive.

From the standpoint of a church like St. Ouen, at Rouen, whose entire plan is swung on "Hogarth's line of beauty" (see figs. 1, 2), the variations in the Episcopal Cathe-

*There is an error of proof in the Sturgis Dictionary relating to the convergence in S. Giorgio in Velabro, where the amount is stated to be one foot. This error is certainly due to a confusion resulting from Mr. Sturgis' work of condensation, as the matter was obtained from my publication.



GROUND PLAN OF CHOIR
CATHEDRAL OF ST. JOHN THE DIVINE, NEW YORK
HEINS & LA FARGE, ARCHITECTS
SHOWING THE CONVERGING LINES IN PLAN OF THE PIERS

dral may appear to be inconsiderable and unimportant. That they are tentative and experimental has been avowed by the designers. The great fact that they exist because they were considered desirable by the designers is still there, and this fact assumes enormous importance when we consider that no modern church (except the one at Methuen, Massachusetts, by the same firm), had previously been designed with an asymmetric plan.

Of equal importance is the point that Mr. Heins has publicly opposed, in a standard Dictionary of Architecture, the generally current modern view that the mediæval architects were incapable of refinements and that all their variations from geometrical design were the result of incapacity or indifference. That Mr. Sturgis agreed with the opinions of Mr. Heins and selected him to write this article as one of special importance, and in view of these opinions, is also known to me.

If Mr. Heins had not written the article in the Sturgis Dictionary, or if his firm had not built the New York Cathedral choir, either one of these facts might appear less significant, but the facts when taken together are certainly much more important than either one would be if considered alone. For it now devolves on the sceptic as to mediæval refinements not only to ignore the existence of a great modern church which has revived the practice, but also to controvert and answer the reasoning and the statements which are contained in the Sturgis Dictionary.

Such reasoning certainly has greater weight as coming from a practicing architect of distinction who made his practice conform to his reasoning in his most important work. Let us therefore listen to Mr. Heins, on "Refinements in Design," page 264, vol. II of the Sturgis Dictionary:

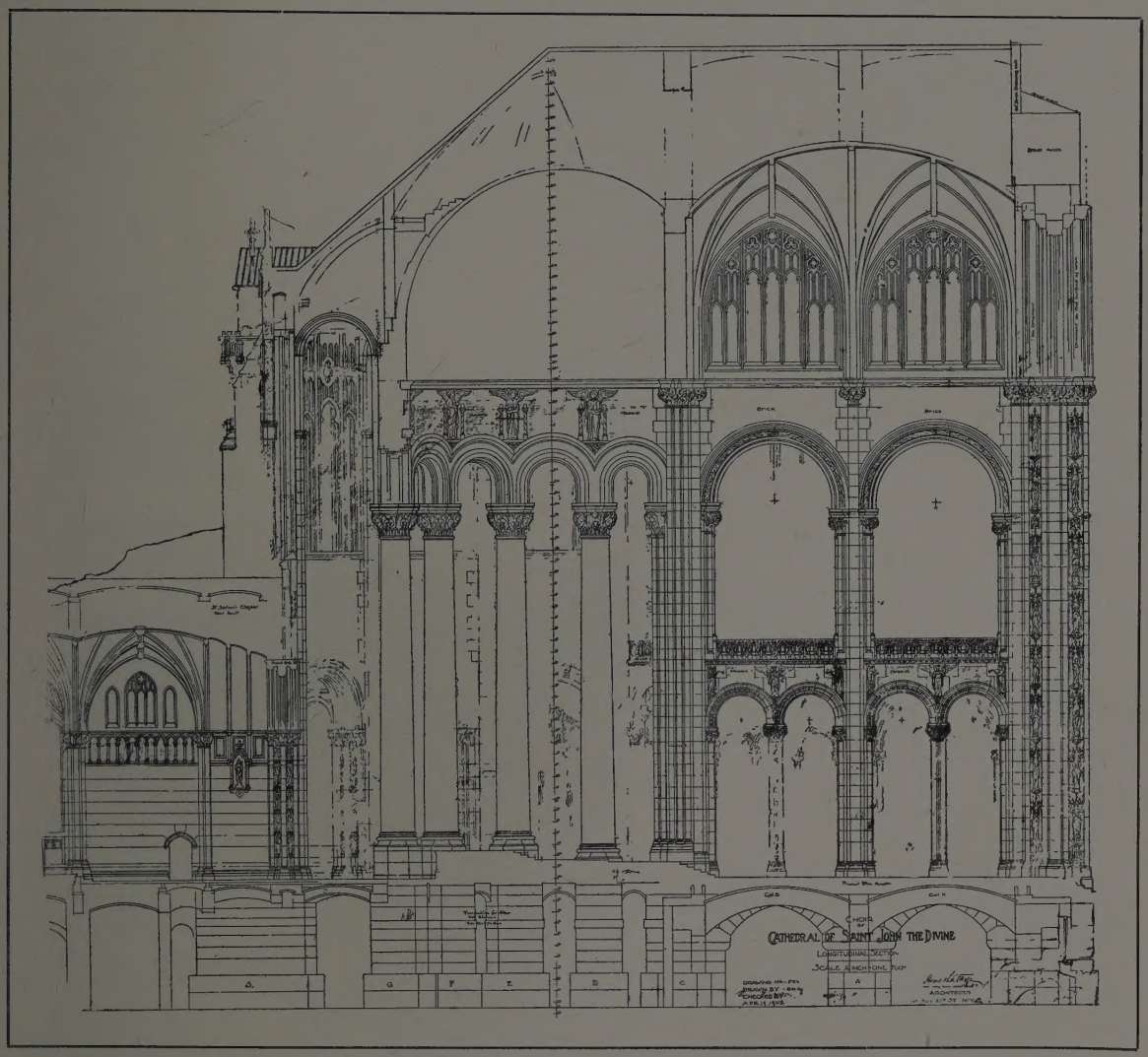
"Refinements in Design.—Intentional deviations from mechanical exactness in architectural design.* These refinements do not relate to such general disposition of the masses nor to such shaping of the details as come under the head of architectural composition; they are elaborate devices, tending to give subtle artistic variety and interest to the architecture by delicate curvatures of apparently straight lines, by slight differences in sizes of corresponding parts otherwise presumably equal, and by a great number of variations and modulations too slight to attract attention as irregularities and yet sufficient to produce an agreeable effect.

The engineer's point of view, as it may be called, is that in a building straight lines should be mathematically straight, and vertical and horizontal surfaces and lines actually vertical and horizontal; also that apparently parallel surfaces and lines should be actually parallel; in a word, it assumes mechanical or mathematical accuracy of construction as a standard of excellence. The artist, however, is influenced in his ideals by what he sees in nature. His is the primordial or natural ideal and is fundamentally dependent upon free-hand work. The very irregularities inseparable from the most perfect free-hand work become agreeable to the trained artistic sense, and just so far is the dull monotony of machine work repellent. The painter will prefer for a subject an old house with picturesque variations and delicate modulations given by time, to a new villa freshly painted, which is, of course, lacking in such modulations.

It is interesting to note in Greek ornament how rarely any form is repeated. The opposite leaves of an anthemion will not be duplicates, one turn of a scroll will be almost invariably a trifle larger than another, and even in the most perfectly finished scrolls, breaks in the exact continuity of curves will occasionally be noticed. The Greeks unquestionably designed their buildings as well as their decorative patterns from the artistic standpoint, and shaped them with the free hand; hence their work was full of animation and interest, their walls, their spacing, having a charm and grace which is utterly lost in the dull copies of classical porticoes made a generation ago in ignorance of the higher qualities of Greek art.

If, then, these peculiarities are hardly observed in modern architectural practice or in the instruction given to the modern architect, it is to be observed that such practice and instruction are so largely based upon drawings that, first, the student is a student not of Greek building, but of drawings of it, in which the refinements could not be given, even if the draughtsman cared for them; and, second, that the architect's career is more dependent upon the agreeable effect of his drawings upon his employer than upon the effect of his completed building. The architect to-day does not carry his free-hand design into execution, but passes it through the ordeal of mechanical draughtsmanship; whereby, as every practitioner knows, it loses immediately almost all its charm and the freshness of the original sketch, and tends to become hard and uninteresting. This tendency existed to a great extent in the time of the Renais-

*The term is capable of other interpretations; but the peculiar importance of the recently observed and surprising deviations named in the definition above requires special examination.



LONGITUDINAL SECTION OF CHOIR
CATHEDRAL OF ST. JOHN THE DIVINE, NEW YORK
HEINS & LA FARGE, ARCHITECTS

THIS SECTION ILLUSTRATES THE PASSAGES IN THE TEXT RELATING TO THE ASYMMETRIES OF THE ARCADES, BUT OWING TO THE REDUCTION IN SCALE IT IS DIFFICULT TO OBSERVE THEM

sance; and still more generally during the Cinque Cento. The fifteenth century student of art studied and measured the remains of antiquity, and this unquestionably brought new ideas into architectural design, but he did not acquire the age-long traditions of the earlier art. Neither did he always retain the traditions of his own past, of the mediæval art in which his masters had worked. Such traditions would, with the natural decadence of art, become confused, misunderstood and overlaid with eccentricities; and it is but natural that when the rich and alluring vista of classical art opened before men's eyes, they should hasten to discard all hampering traditions, the good with the bad. In this way, while the traditions of the Greeks or the Greco-Roman builders were not to be recovered, those of the Middle Ages were of course neglected."

After this introduction the article proceeds to describe the Greek refinements and the various theories which have been advanced to explain them and reaches the following conclusion:

"If, however, we can give a satisfactory reason why a column should have an entasis, that same reason will suffice to account for all the other refinements as yet known to exist, at least in classical work. The only satisfactory explanation of them is that the entasis and other such refinements were introduced from artistic preference, from delight in the abstract beauty which results from their use."

The subject of mediæval irregularities is next taken up as follows:

"With regard to mediæval buildings, the existence of apparently deliberate irregularities in measurement was pointed out by Ruskin in *The Seven Lamps of Architecture*, published in 1849, and in *The Stones of Venice*, published in 1851; and Viollet-le-Duc in the *Dictionnaire de l'Architecture Française*, s. v. Trait (Vol. IX, first published 1868), deals with the same subject. There has been, however, no such comprehensive investigation as that undertaken by Professor W. H. Goodyear, of which the results were published in part in the *Architectural Record* (Vols. IV, VI, VII, VIII, IX, New York).

In such investigations great discretion must be exercised. It is evident that thrust and settlement may produce unexpected results; masonry is, moreover, plastic to a certain extent, and stone may be appreciably distorted by long-continued pressure. There is, too, the element of mere carelessness and incapacity for accurate work to be considered. The case is further complicated by the fact that these refinements are not universal in mediæval buildings. They are usually present in direct ratio to the amount of Byzantine influence visible in the work. Where they exist it is generally in larger and richer churches rather than in the poorer ones—and this has evidently some bearings upon the question whether they are the results of carelessness or of design. Where the same irregularity occurs on both sides of a church in corresponding places, where a cornice has an even and regular curvature, and examination shows that the stones were originally cut to fit the curve, where a curve in plan is regular from the base of the walls up, with no opening of joints, or where a striking irregularity of arrangement is found repeated in a large number of instances, the conclusion seems irresistible that these particular deviations were intentionally put in. * * * It is evident how inconspicuous they generally are when we consider the surprising fact that irregularities so large as some which have been pointed out should have remained unnoticed by thousands of visitors until revealed by careful measurement."

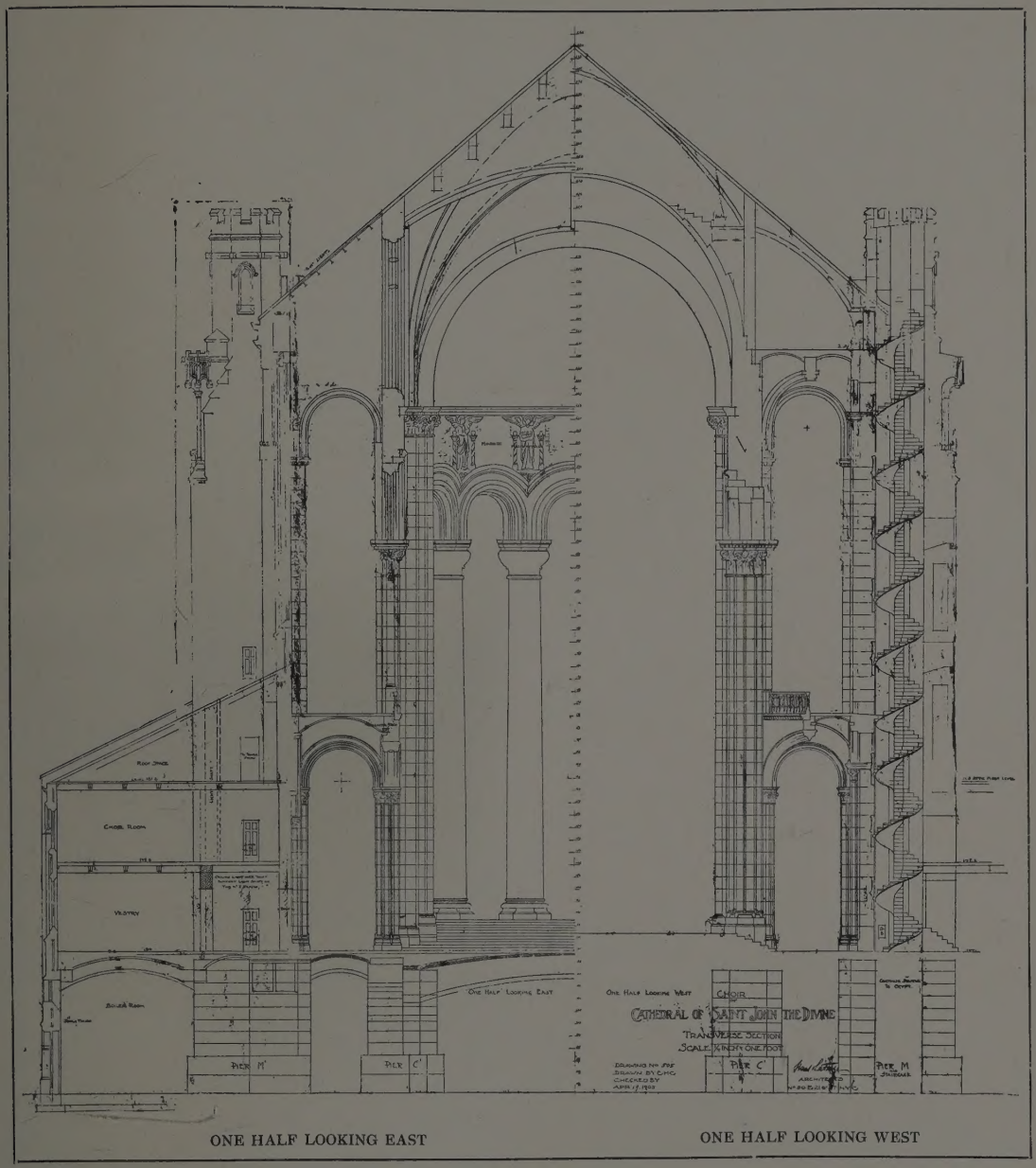
The remainder of the article is devoted to quotations of examples from individual mediæval churches and although these examples, as published, are all taken from the Brooklyn Museum research, as described in the *Architectural Record,* it is a point of much importance that the original manuscript of this article contained a number of citations of independent observations by Mr. Heins (not so mentioned by him, but so noted by me). On this account the manuscript was loaned to me and remained in my possession for about nine years. Mr. Heins asked for its return very shortly before his death and after the date of the quoted letter.

The memorial addition to the First Church at Methuen, known as the Nevins Memorial Chancel, narrows in plan from 21 feet 4 inches to 20 feet 4 inches. Mr. Heins stated in a letter to me dated April 15, 1898:

> "The idea was simply to avoid the harshness and monotony of exact rectangles.* It seems to me that the effect in execution, while it is not noticeable as a distortion, unless pointed out, does make the chancel look less stiff and formal.
>
> You have so largely increased our information on this subject that I now feel safe in putting in many variations, in work of this sort, because they seem to me to make it vastly more interesting." *

Another interesting expression of Mr. Heins' views was contained in a letter which

*It may not be immediately obvious to those who have not paid attention to the subject that the actual effect of deflections in plan is to change and confuse the effects in elevation, but such is the case. The resulting optical effects of deflections in plan are effects in elevation.



TRANVERSE SECTION OF CHOIR
CATHEDRAL OF ST. JOHN THE DIVINE, NEW YORK
HEINS & LA FARGE, ARCHITECTS

acknowledged the receipt of my *"Reply to an Article in the Builder on the Glamour of Crooked Building"* (published and circulated by the Edinburgh Architectural Association, November, 1905). Mr. Heins' answer consisted of two sentences, one to acknowledge the receipt, and the other as follows: "My own point of view has led me to a very simple conclusion: artists appreciate the glamour of crooked building, and it makes very little difference whether the rest of the world like it or not."

II.

The natural enquiry now rises. Is the choir of St. John the Divine destined to be an exceptional and sporadic instance of revival of mediæval methods, or does it mark the beginning of a new movement in modern architecture? This enquiry suggests the remark that if the building of the new Fifth Avenue Baptist Church had not been interrupted, first by the illness of the rector and then by his subsequent acceptance of a new charge, it might have offered a second important example of such revival. Mr. Wm. Welles Bosworth had not only determined to introduce variations of alignment and dimension in the details of the façade of the new church, but actually made a trip to Italy for the express purpose of studying the Pisan Romanesque with this end in view. Provisions for such arrangements were also formally made in his draughts of specifications for contractors' work.

Not the least important part of Mr. Bosworth's relation to this matter is his extremely felicitous baptism of the subject by a new name, viz., "temperamental architecture." This was simply the title of an illustration in an article which he recently contributed to an architectural publication and he made no further reference to that particular title in his text, but it may be that this term is worthy of replacing the word "refinements" as a general title for the topic. No one who reads Mr. Heins' letters, as just quoted, can fail to realize the aptness of this term.

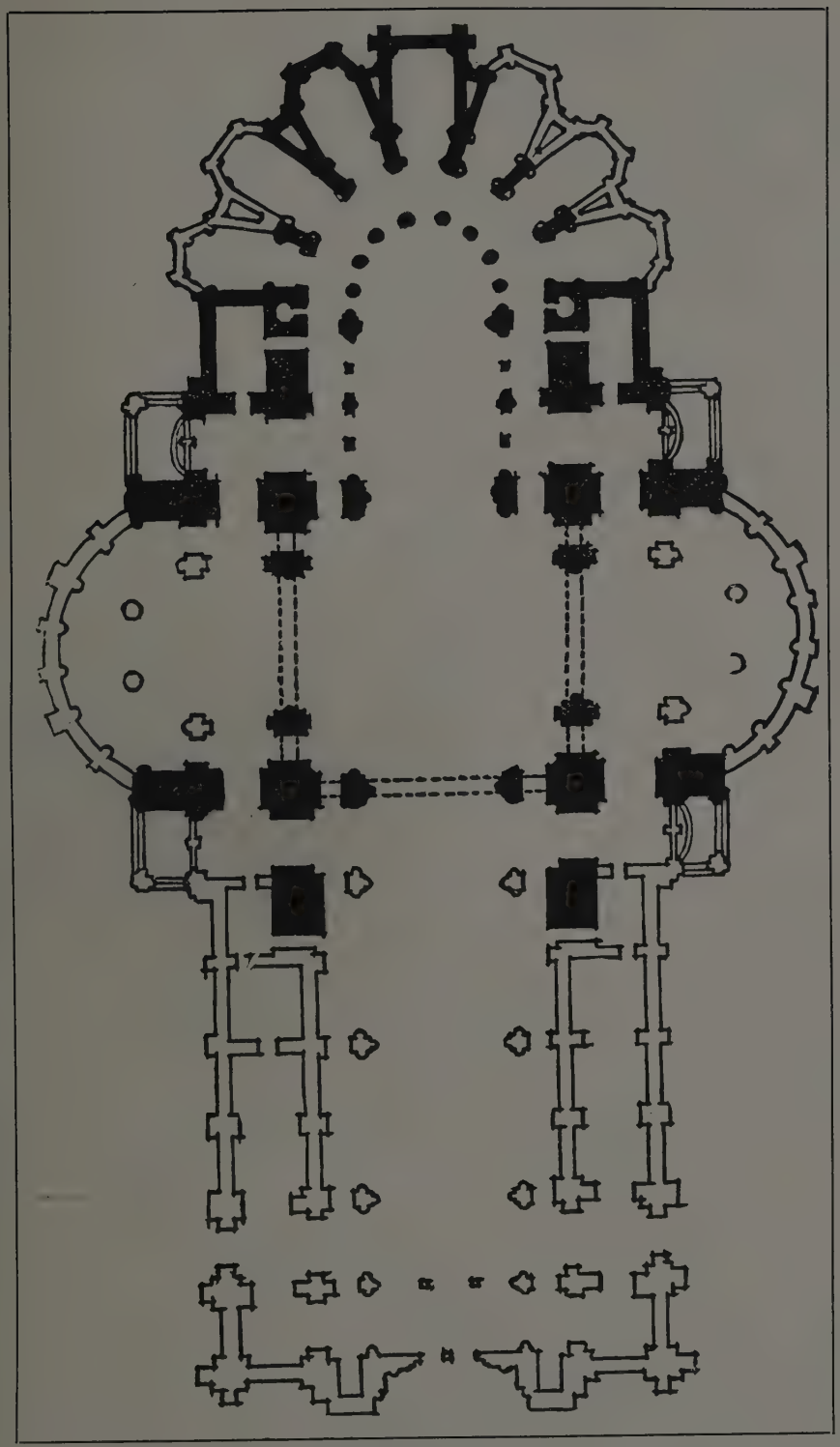
The term "temperamental architecture" appears also to be a sort of solvent (all the more effective, because unintentional) of that very natural but very mistaken view about the mediæval builders; that because they were never anxious about having architecture straight or uniform, they were never distressed or disturbed when it was rigid, hard and dry. The general view has been that many mediæval builders were indifferent to geometrical uniformity or mathematical accuracy, and therefore that no mediæval builder ever deliberately counteracted or avoided the effect of monotony or uniformity.

Men as far apart in time, and as diverse in training and knowledge, as John Ruskin and Auguste Choisy, have both made the point that the mediæval unintended lack of regularity was an expression of the same spirit which, at other times, intentionally avoided regularity. However misleading and erratic Mr. Ruskin's artistic criticisms may have been in many particulars, his *Lamp of Life,* in the *Seven Lamps of Architecture,* struck the right note in this particular. Auguste Choisy, who was one of the soberest intellects and one of the greatest engineers of our period, has also recorded his opinion that mediæval irregularities are more frequently the result of calculation than of negligence—"il y eut plus souvent calcul que negligence," and he adds on a following page—"D'une manière générale les architectes du Moyen Age évitent la froide regularité."*

"Temperamental architecture" seems to be a term which covers both the doubtfully purposed, and the definitely determined, irregularities of mediæval practice. It affirms that the picturesque, when unconsciously produced, is equivalent, in results, to its creation when consciously produced with deliberate intention. It indirectly affirms, that a determination as to deliberate intention is comparatively unimportant and unessential.

If we adopt Mr. Bosworth's term "temperamental architecture" it may somewhat assist a determination as to what part "refinements" may play in modern architecture. The answer seems to be: given a temperament of the kind which Mr. Heins himself stated that he possessed, and which Mr. LaFarge's Scribner article shows that he possesses and which Mr. Bosworth's quoted article shows that he also possesses, and it may be confidently expected that similar temperaments will be much assisted in their

**Histoire de l'Architecture,* Vol. II, pages 410, 412.



GROUND PLAN—UNCOMPLETED WORK IN OUTLINE
CATHEDRAL OF ST. JOHN THE DIVINE
HEINS & LA FARGE, ARCHITECTS

own development, or self assertion, by a wider knowledge of what the mediæval temperament tolerated, or deliberately did, as the case may be, and without any very anxious enquiry as to the cerebral process involved.

In country house architecture, at least, there is much opportunity for temperamental design. In fact the absence of anxiety as to symmetric planning, already general in this field, clears the matter quite satisfactorily. If the openings are designed from the interior and purely for interior convenience, the main end and the most desirable results will have been reached.

Thus the results of a historical or antiquarian research as to constructive mediæval asymmetries, as determined by a more exact attention than they have previously received, ought to be favorably greeted by members of the architectural profession. It appears probable that the future of modern "temperamental architecture" will be largely determined by the success or failure (in public estimation) of this historic research. That this research may achieve general recognition, ultimately, is certainly suggested by the choir of St. John the Divine and by the published opinions of Mr. Heins and Mr. Bosworth, not to overlook those of Mr. C. Grant LaFarge as contained in his Scribner article, and these may also now be quoted:

"Within the last few years a large number of careful measurements have been made of all sorts of mediæval buildings, and very suggestive theories been deduced there-from; theories which have been hotly discussed on both sides of the water. There is no intention, as there is no space, here to add to the volume of the discussion or to decide whether the innumerable and sometimes startling irregularities in nearly all such work were mainly accidental or a conscious and calculated element of design. But we may well ask why it is reasonable to believe that men who knew enough to build masonry so complex that it would baffle the most skilful to-day to design; who discovered the most luminous principles of construction and applied them in the noblest manner; who left works of such transcendent beauty that the world ever since has been lost in admiration, should at the same time have been such feeble incompetents that they could not build straight. If they had rules, these are lost in the mist of time and probably we shall never know them, but is it not at least a tenable hypothesis that these giants of old worked in the great mass with the same sensitiveness that guided their detail; that they knew how to give the whole vast structure the personal charm of a successful sketch? Let us rest assured that they were no slaves of the T-square and triangle fetich, nor of the *chic* drawing; no victims to the idiotic notion that straight lines and equal measurements possess any intrinsic superiority."

NOTES ON THE ILLUSTRATIONS

Fig. 1. St. Ouen, Rouen.—South Triforium, looking west. Taken with the back of the camera close to the south transept angle. The entire church is planned on a double or return curve (attenuated letter S, or "Hogarth's line of beauty"). The view *includes the beginning of the return curve* which continues in the choir. A cord was stretched along the floor of the gallery in order to show the curve as contrasted with a straight line. The line of this cord has been strengthened by a pen in the photograph. The deflection of the curve between the farther west end of the gallery and the last pier of the nave (in the foreground of the picture, where the first shadow falls), is 0.70 feet or 8½ inches. An 8x10 inch disk may be seen at the point of greatest deflection. The shadows falling on the wall and across the floor of the gallery show the positions of the piers and the points at which the measurements were taken between the stretched cord and the faces of the piers. These measurements show a gradual and sequent change of position in each pier, thus representing a true curve. The variation in amount of the curve on the two sides of the church is *only* 0.13 *foot or* 1½ *inches*. The curve on the north side is 0.83 feet, as compared with 0.70 feet on the south side. The measurements for the curve on the south side (fig. 1), as taken along the stretched cord, at each pier, are as follows from east to west (from the first shadow to the end of the line), in decimals of a foot: 0.00: 0.11: 0.32: 0.45: 0.55: 0.70: 0.48: 0.31: 0.15: 0.00.

These curves begin at the fundations but are most easily seen and photographed, and most conveniently measured, in the gallaries. Compare fig. 2, for the north triforium. The two sides of the church are parallel.

Fig. 2. St. Ouen, Rouen.—North Triforium, looking west. Taken with the back of the camera close to the north transept angle. The entire church is planned on a double or return curve (attenuated letter S, or "Hogarth's line of beauty"). This view *includes the beginning of the return curve* which continues in the choir. A cord was stretched along the floor of the gallery in order to show the curve as contrasted with a straight line. The line of this cord has been strengthened with a pen in the photograph. The deflection of the curve between the further

west end of the gallery and the last pier of the nave (in the foreground of the picture, where the first shadow falls) is 0.83 feet or 10 inches. An 8x10 inch disk can be seen at the point of greatest deflection. The shadows falling across the floor of the gallery show the positions of the piers and the points at which the measurements were taken, between the stretched cord and the clerestory wall. They show a graduated and sequent change of line in the wall and represent a true curve. As taken from east to west, from the first shadow in the foreground to the farther extremity of the line, these measures follow here, in foot decimals: 0.00: 0.20: 0.47: 0.70: 0.83: 0.80: 0.70: 0.52: 0.20: 0.00.

These curves begin at the foundations but are most easily seen and photographed and most conveniently measured in the galleries. Compare fig. 1, for the south triforium. The two sides of the church are parallel.

In spite of the wide fame of St. Ouen, there is no extant published plan of this church which does not show its lines as straight. How far its curves are otherwise generally overlooked may be best determined by the readers of this paper.

The convincing character of these photographs is due to the fact that they are taken in the triforium galleries, which are only about two feet wide, and that they therefore show the curves in duplicate in each gallery; in the clerestory wall on each side, as well as in the line of the parapet on each side, as determined by the positions of the piers.

As a contribution to the controversy which Mr. LaFarge mentions as a "hot discussion," but which, in spite of his modesty on this subject, may be considered as closed in many directions by his own participation in the revival of mediæval practice, these photographs have unique importance, because they appear to give a conclusive negative to the explanation of the mediæval deflections in plan which has been offered by the Comte Robert de Lasteyrie, by Mr. John Bilson and by Mr. E. S. Prior.

It has been announced by these distinguished antiquarians that (aside from irregularities of site) such deflections are explained by the mediæval practice of screening off the completed portion of a church, for purposes of worship during the completion of the remainder of the church. (This practice is illustrated in modern times by the screen wall in St. John the Divine, which separates the completed crossing and choir, from the unbuilt nave.) Then (it is said by these authorities), when the unfinished portion of the church was continued, the lack of scientific methods, and of scientific instruments of survey, was the cause of involuntary and unintended deflections of plan.

When this theory is applied to St. Ouen and to the measurements which are quoted in the captions of the illustrations, it appears that this theory would call for eleven screen walls in the nave and for four screen walls in the choir; aside from the manifest improbability that accidental deflections in plan would take the form of *two* parallel return curves on *each* side, which are parallel on both sides of the church. This argument so far applies to the nave and clerestory but it must also be remembered that the outer walls of the church follow the same curves, so that we are obliged to presume that six parallel return curves in plan are all due to defective methods of construction and planning, if de Lasteyrie's theory be accepted.

The only other possible explanation, aside from that of an æsthetic purpose, is that of symbolism. The argument of Comte Robert de Lasteyrie against symbolism appears to be conclusive. See his publication: *La déviation de l'Axe des églises est elle symbolique?* Paris. Librairie C. Klinck-Sieck (1905).

St. Ouen exhibits the widening refinement in straight lines. See the *American Architect*, March 16, 1910, plate 4, and Professor Charles S. Hastings, of Yale University, in the *Architectural Record* for August, 1909. The piers lean out in lines which are straight from the pavement up, to the amount of 5-5½ inches to a side, in a height of about 80 feet. These inclinations are parallel and uniform, both in the nave and choir. The exterior buttresses have been determined as perpendicular (in 1910) by plumb line photographs (so far confined to the north side). A remarkable feature about the triforium photographs of the curves and the related measurements, is that they indirectly illustrate the accuracy of the widening refinement, because the amounts of curvature in the alignment of piers only vary by 1½ inches on opposite sides of the church, at the great height of the triforium, although the piers themselves are inclined from 5 to 5½ inches in a height of about 80 feet.

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CONTENTS

Architectural Refinements

WE COMMEND to the thoughtful consideration of our readers, Professor William H. Goodyear's article in this issue, describing and analyzing the architectural refinements introduced by the architects, Messrs. Heins & La Farge, into the Cathedral Church of St. John the Divine. The refinements practiced by architects of mediæval ecclesiastical structures prior to 1600 A.D. have gradually disappeared out of art. The rediscovery of the valuable principles underlying these features of asymmetry is directly due to the energy and personal effort of Professor Goodyear.

Beginning in 1895, he has many times visited Italy and on each occasion secured numerous scientifically accurate photographs, and made many measurements. Careful study of this absolutely reliable data has enabled Professor Goodyear to establish the fact that in mediæval buildings the asymmetry was not due to indifference as to accuracy of measurement, but was undeniably intentional. The difficulty that confronts the architect in applying these refinements to modern buildings lies wholly in the fixed traditional habits of modern masons and modern designers. This is more true of the mason than of the designer. The architect finds that he has to contend with the mason who cannot be induced to regard dissymmetric construction as anything but unworkmanlike, and he is not disposed to discard his level and plumb-line and liberally follow out the architect's ideas. In mediæval work the architect was also a mason and in many ways the masons employed by him had the same capacity and talents. It was therefore safe and possible to permit certain latitude in the handling of material, and allow the masons to invent and insert such decorative detail and irregularity of line as might be suggested and would be natural on account of temperament and habits of working. This method of construction if pursued to-day would prevent the accuracy of estimating labor and material that has done so much to retard the introduction of the artistic and personal touch in constructive work. Modern methods cannot comprehend a leaning façade, a widening refinement or a curve in plan as anything but structural errors and unsafe building.

It is therefore fortunate and a portent of more artistic methods of designing, when so important a structure as the Cathedral illustrated in this issue should be the first to embody in a building of this kind, although in a limited way, refinements similar to those that have made the work of the mediæval architect enduring and acceptable.

We regard Professor Goodyear's research as one of utmost importance. Its endorsement by a large proportion of the men in the profession, is a just and fitting recognition of years of patient and unselfish labor.

A Triumph in Construction

WE HAVE received a communication from a correspondent whose wide experience entitles him to speak with authority, in which he states: "I regard the temporary dome over the crossing of the Cathedral of St. John the Divine as the most remarkable feat of construction ever successfully attempted in this country and perhaps anywhere abroad."

Mr. Perrine's article printed elsewhere in this issue is an authoritative presentation of

the subject and is, we believe, the first publication of a thoroughly technical description by one directly engaged on the work. As Engineer to the Committee of the Fabric, it became the duty of Mr. Perrine to superintend this work, and carry forward to a successful conclusion the extremely difficult and delicate task of building a dome without the temporary support of false-work or other aids heretofore used in similar construction.

This marvelous work stands a record of the daring and ingenuity of Mr. R. Guastavino, who conceived the idea and who was ably supported by Messrs. Heins & La Farge, the architects, and Mr. William Barclay Parsons, their consulting engineer.

Nothing like it has ever been attempted and its successful completion is a tribute to Mr. Guastavino's resourcefulness and indomitable energy, and to the broad-minded policy of the architects who were quick to appreciate the merits of the suggestion offered.

It is to be regretted that at some future time when the central spire is completed the central partition of this dome must be demolished, and that it cannot remain a permanent example of the skill of its inventor and the work of the modern engineer.

The Asch Building Fire

THE disastrous fire which occurred in the Asch building on Washington Place, this city, on March 25th, when more than one hundred and forty lives were lost, presents so many phases for consideration and provides so much opportunity for study of modern methods of fire prevention and the protection of life, as to claim more than passing notice.

It is most unfortunate that the warning given by Fire Chief Croker some six months ago, soon after a similarly disastrous fire in Newark, when he stated that the same thing might easily happen in New York, was not better heeded, and it is to be deplored that it should require so frightful a loss of life to demonstrate how thoroughly inadequate are the provisions of the present code to prevent what has now occurred.

That fire prevention is even more important than fire protection has been insistently reiterated by men whose judgment is valuable and whose opinions are entitled to respect.

The consensus of opinion among fire underwriters is that the loss of life and damage to property in the Asch Building fire was largely due to the absence of the usual appliances generally acknowledged as essential to proper prevention and protection.

The absence of automatic sprinklers in a building used for manufacturing purposes and one where so many people were employed has been referred to as the reason for the rapid spread of the fire and the consequent panic and loss of life. The necessity for a law compelling the installation of sprinklers in all buildings more than sixty-five feet high, has been urged by men of wide experience and familiarity with fire risks in this city.

The failure, during the closing days of the McClellan administration, to adopt a proper code, and the dilatory action of the commission appointed by Mayor Gaynor, leaves the city with a code antiquated in its provisions and devoid of those safeguards that are believed by every one competent to discuss the subject, as of the first importance.

Fire Chief Croker's recommendation, that a bureau of fire prevention be organized in his department was one based on experience and a thorough understanding of the city's needs. His prediction of a similar disaster to which we have already referred was based on long experience as a fireman. If the advice of so competent a man may be disregarded, where shall we look for a warning that will be heeded or a quick awakening to the pressing need for prompt and vigorous action on a matter so important?

WESTERLY FRONT OF CROSSING

SHOWING SCAFFOLDS FOR CONCRETE CLOSURE WALLS AND DOME

THE CONSTRUCTION OF THE TEMPORARY DOME

OVER THE CROSSING OF THE CATHEDRAL CHURCH OF ST. JOHN THE DIVINE

By GEORGE PERRINE, C.E., M. AM. SOC. C. E.

ENGINEER IN CHARGE OF CONSTRUCTION, REPRESENTING THE ARCHITECTS AND THE COMMITTEE OF THE FABRIC

THE Cathedral Church of St. John the Divine, situated on Morningside Heights, in New York City, of which Messrs. Heins & La Farge are architects, was begun in 1892. It has been under active construction since 1901, and is now temporarily enclosed up to a point midway between the westerly end or front and the easterly wall of the main body of the structure. In addition to that portion of the main building now completed two of the seven chapels are finished. These chapels are located at the easterly end of the Cathedral.

The portion of the Cathedral now enclosed and ready for use includes the crossing which is bounded by the piers supporting the four great arches and the interior piers, the choir, the chancel and the ambula-

tory. All portions of the choir and chancel are parts of the permanent structure. Temporary closure walls have been built around the ambulatory in the openings opposite the chapels to be built in the future.

Concrete walls have been erected between the granite piers and beneath the great arches to temporarily enclose the crossing. These walls are twenty inches thick at the level of the crossing floor, sixteen inches thick for a height of about sixty feet, or to the spring-line of the great arches, and twelve inches thick from that elevation to the intrados of the great arches. Each of these three walls is braced at two points by steel trusses to resist the wind pressure, the lower truss being fifty-three feet above the floor of the crossing, and the upper truss thirty-nine feet above the lower truss and thirty-three feet below the intrados of the arch. Two pilasters were built on the face of each wall and reinforced with steel rods, to the floor and the trusses, besides adding somewhat to the architectural appearance of the plain walls.

Six heavy steel tie-rods were built into each of the great arches, with the exception of the easterly arch braced by flying buttresses, in order to avoid building four more buttresses at the present time. These four buttresses, however, will be constructed later as part of the permanent structure.

One of the most important problems which had to be considered before completing the temporary enclosure of the crossing was that concerning the roof construction to be adopted. The space to be covered is that surrounded by the four great arches designed to support the spire, and is a square whose sides are ninety-three feet and six inches.

The crowns of the great arches are one hundred and forty-three feet above the ground, and owing to that fact as well as

EASTERLY GREAT ARCH

ROOF OF CHOIR AND CHANCEL. THE BEGINNING OF THE PENDENTIVES

EASTERLY GREAT ARCH

PENDENTIVES FINISHED AND DOME COMMENCED

to the great area to be covered, any roof construction of steel and wood that could be erected and removed would be very costly indeed. Another point considered in adopting any kind of roof construction was that it should not interfere materially with the building of the large masonry ring upon the great arches to receive the supporting piers of the spire.

The R. Gustavino Company, which had already completed the roof of the choir and chancel, the hanging ceiling beneath the choir roof and other smaller details, was requested to submit plans for the temporary roof, together with suggesting a method of erecting it with the least possible interference with the other work going on at the same time.

The plan submitted was that for a tile dome and the method of erecting it was quite novel, and on account of its wide departure from any methods of construction of similar work now in use it was a bold undertaking. The important feature in the method of constructing the dome was that the working scaffold was built upon the dome as the work progressed while no false work was used to support the dome from below at any stage of its progress.

The tile construction may be divided into two parts, the four pendentives at the intersections of the great arches which are permanent parts of the building and the temporary dome resting upon the pendentives and above the tops of the great arches.

On account of the extreme thinness of the dome proper it was very important that there should be some method of testing the radial dimensions of the work as it progressed, in order that an exact spherical shape might be obtained, as any irregularities from the true shape would cause weakness in the finished structure.

The pendentives and dome are built entirely of hard burned red brick tiles measuring six inches by fifteen to eighteen inches and one inch thick. They were baked in groups of six flat tiles, each set forming a hollow rectangle for convenience in shipment and handling, and are easily broken

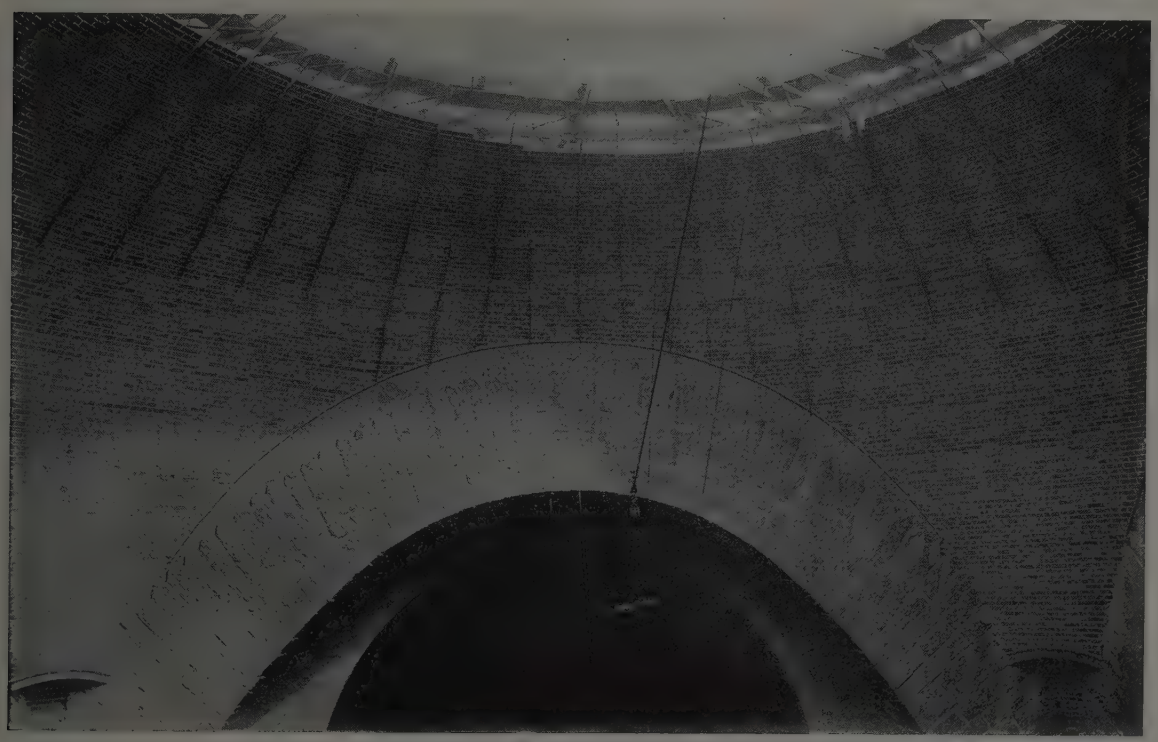
apart at the site of the work ready for laying in the work.

The pendentives and a few courses at the base of the dome are built up of nine courses of tile, making the work twelve inches in thickness, including the mortar joints. The remainder of the dome is stepped off at intervals from nine courses of tile to five, four and three respectively, the three courses giving four and one-half inches of shell.

In order that accurate measurements could be taken at all times during construction, four one-quarter inch twisted wire cables were fastened, one at the crown of each of the great arches, and made adjustable by turnbuckles and brought together at the centre of the crossing and fastened to the corners of an eight inch square iron plate in the centre of which was a ring-bolt to which was fastened a wire cable extending to the floor of the crossing. Upon the floor of the crossing a heavy stone was placed directly beneath the iron plate and the vertical wire stay was securely tied to it and made adjustable by using a turnbuckle. A swivel attachment was fitted to the centre bolt in the iron plate for the purpose of holding the ends of two steel tapes used in laying out the tile work. The outer ends of the tapes were always kept fastened to the scaffold conveniently at hand for the use of the masons.

The tapes used were those generally employed by electricians in drawing cables through ducts, as very often the wind was so strong that ordinary steel measuring tapes would have been broken.

The position of the steel plate centre holding the tapes was checked by transit observations and by level readings every two or three days and adjusted if any movement had occurred. At first there was found a variation of one-half inch to one inch in the position of the plate due to the stretching of the new steel cables supporting the plate, but after a short time the variation was practically nothing. As soon as the tapes were ready for use, circular arcs were marked upon the sides of the great arches locating the position of the pendentives. The pen-



DOME ONE HALF COMPLETE

THE TACKLE SHOWN WAS USED TO HOIST MAN WITH STEEL TAPE WHEN CHECKING HEIGHT OF PLATE SUPPORTING MEASURING TAPES. TWO OF THE WIRE CABLES SUPPORTING STEEL PLATE MAY BE SEEN ON EITHER SIDE OF BLOCK AND BALL

dentives ran above the granite a short distance above their bases, and where this occurred an eight inch brick wall was built to receive the tile work. After the positions of the pendentives were located, four tile squinch arches were built for the bottoms of the pendentives to rest upon; these arches were nine inches thick and twenty-four inches wide with a span of about eight feet.

Scaffolds were built upon the great arches beginning a little below the bases of the pendentives, to support the masons and building materials.

The pendentives were started upon the small arches and built up true to lines as measured by the tapes, until the work was high enough to allow the use of the templates or guide boards used throughout the remainder of the work. These templates were cut to the arc of a great circle of the dome and attached to the tile work by means of wires fastened to them and run through three-quarter inch iron pipes built into the tile work.

The templates were eight feet long and eight inches wide at the centre and cut from seven-eighth inch lumber. The boards were put up in sets of two, their ends being fastened together by a one-quarter inch bolt to act as a hinge. One board was fastened to the old work in a vertical plane and the other was allowed to hang downward on the inner side of the dome until the tile work reached the top of the first board, when the second piece was swung into position on the hinge and fastened to the scaffold above the dome.

This method of shifting the templates was continued until the dome was completed. As soon as one section of the pendentive or dome was completed the lower templates were cut loose and lowered to the floor and used again for guiding the new work.

In laying the tile the first or inner course was set in plaster of paris mortar, used on account of its rapid setting qualities. The first tile in any course of the inner surface of the work was well covered with mortar on the lower edge and one end, and these pressed firmly against the edges of the tiles in position, at the same time adjusting its inner face to the lines formed by the templates. Care was taken to lay each tile true with the preceding course, when they were held in position by the mason's assistant until the second tile also jointed with mortar was set in position, when it was then held by the assistant for a short time until it was set strongly enough to stand alone.

This operation was repeated for successive tiles until all of the masons working on the course reached the point where their neighbors commenced work; the course was then completed.

Near the foot of the dome, where the distance between the templates was a maximum, several intermediate tiles between the templates rested without touching the templates, and were set by swinging the tape from template to template along the course in progress of erection. When an inner course was completed and the mortar sufficiently set the second ring of tiles was laid in Portland cement mortar partly on the inner course and partly on the course below, breaking joints. After this the third ring was laid, and so on until the full thickness of the arch was built up, when a second and third course was laid in like manner, making three full courses of three to nine rings in thickness for a single day's work. Three courses have a combined width of a little more than eighteen inches, which is as far as a mason could conveniently reach to lay tile and be supported by the hardened work.

At the commencement of the dome, where the shell was thickest and the circumference was greatest, a large number of masons were employed, and as the thickness and circumference decreased the number of men was reduced until near the top, where only four masons were required.

The pendentives have a uniform thickness of nine courses, or about twelve inches of solid tiles and cement, and are reinforced by four three-quarter inch horizontal bars of steel built into the work. The dome is similarly reinforced but with the rods running radially, and built into the shell between the first and second layers of tiles.

Where the dome rests upon the crowns of the great arches a toe of concrete was built to act as a base, this base being fastened to the arches by heavy steel rods set into holes drilled in the granite. Just above the great arches and running around the dome a group of 6¾ inch steel rods are built into

the masonry to act as reinforcement against the hoop tension developed in the dome construction.

The elevations and general divisions of this work are as follows:

Elevation of ground, 125 feet, crossing floor 131, spring line of great arches 198, intrados of same at centre 256, crown of great arch 268.

Elevation of squinch arches 240, centre of dome and pendentives at which steel tapes were attached 226. The radius of the dome is 66 feet 2 inches, making the elevation of the dome 292 feet 2 inches, or 161 feet 2 inches above the floor of the crossing.

The first course of the pendentives was laid May 1, 1909, and the last course June 7. The dome was completed August 16, 1909.

The dome pendentives and the tops of the great arches are covered with three courses of Barrett's No. 28 standard roofing felt, lapped six inches, and each course covered with roofing cement. The upper course of felt is covered with four applications of plastic cement except at the bases of arches, where there are nine applications.

Light brick walls were built along the outer faces of the great arches, so that the water would be diverted downward to the bases of the arches, where a basin was formed by building a brick wall around the top of the four large piers, these basins were then drained by leaders running to the sewer. During the erection of this work, there were no accidents whatever causing injury to the men employed upon the dome or any to those at work below.

The work was carried on from start to finish as originally planned and without any interruption.

NEWS NOTES AND COMMENT

Architectural and Other Art Exhibitions

With the opening of the T Square Club exhibition, on the 16th of April, the last of the annual exhibitions of the season of 1910-11 is now in progress.

This very energetic organization inaugurated its exhibition in the usual happy manner by a dinner held in the club rooms on the opening night. The topic under discussion was the value of architectural exhibitions, and the method of holding forthcoming exhibitions will no doubt be largely influenced by the views expressed on this occasion.

Just at this writing it is not possible to review at length this important exhibition, a more extended notice of which must be deferred until our May issue. It is not necessary to state that it presented the usual representative character and in the value of the material displayed, is fully up to the high standard set by the T Square Club.

The exhibition of the Chicago Architectural Club, closed on March 26th. This was an unusually large exhibition and successfully showed the material advancement of the cause of good architecture in the middle West. The entire exhibition was a very dignified exposition of current architectural work.

The annual exhibition of the National Academy was the principal feature of this season's picture exhibitions, and was notable on account of the large number of interesting and well painted canvases by men who are new in the field of the painters' art.

It is an encouraging sign of the future when the younger generation of painters are displaying so much thought in the choice of subjects and such unmistakable ability in their manner of execution.

Mr. C. Howard Walker, architect, was among the number elected at the annual meeting, as an Associate of the National Academy of Design.

It is gratifying to note the appreciation of this National body of artists of the work that the architect is doing in the upbuilding of good art in America.

Chapters and Societies

The usual activity is evident among the various chapters of the Institute. The influence of this progressive spirit on the part of local chapters is of undoubted value. It tends to conserve the rights of members of the profession, uphold the dignities of practice and prevents many errors on the part of well meaning but poorly advised State and Municipal bodies. This very active spirit is also displayed by the architectural clubs, who by well directed encouragement of the younger men of the profession are teaching them respect for their calling and upholding the dignity of the entire profession of architecture.

Ecole des Beaux-Arts

Many important changes have been made in the program of studies in the Ecole des Beaux-Arts, Paris. Particularly is this the case in the course in construction. This course will be extended to cover a period of two years. Heretofore construction has not been taught during the first year, but in view of the broad field now necessary to be covered, the course will begin with the first year of study. It will be called "Course in the Art of Building" and in its scope and thoroughness will be much wider than in previous years.

Just whether or not this decision is the result of criticism that has been made in this country it is not possible to say, but it certainly indicates a very commendable recognition on the part of the Ecole of the importance of the structure in design.

Books Received

Art in Northern Italy, *by Corrado Ricci,* Director General of Fine Arts and Antiquities of Italy. Full cloth, 370 pp. 5x7½ inches, price $1.50. New York, Charles Scribner's Sons.

The architect must needs read many books, and have even a greater number at hand for reference if he expects to keep in touch with what is going on throughout the world of art. To aid him in his selection and to advise him of the latest publication of such books as in our judgment are suited

to his needs, THE NEW YORK ARCHITECT will from time to time note concisely such publications as it believes are of value.

In the present instance, this work on Northern Italy should certainly be included in the architect's library as it is a valuable and well written description of that wonderful treasure-field of art that holds a charm for every one who has been fortunate enough to visit it.

The author's artistic affiliation and official duties have brought him into intimate relation with all that he describes.

The book is profusely illustrated in color and black and white. The translator has apparently retained all the charm of the author's literary style. To the student and man in practice the book is worth while and it is entitled to a place on the library shelf.

THE LIGHTING OF THE CATHEDRAL CHURCH OF ST. JOHN THE DIVINE

Among the many unique and impressive features of the new Cathedral Church of St. John the Divine, none is more striking than the artificial lighting.

In the cathedrals of Europe, dimly lighted interiors have long been associated with these edifices, due to the fact that it has been impossible to find suitable lighting devices to harmonize with the massive architecture of these impressive buildings.

However, in the new Cathedral of St. John the Divine perfect co-operation of architect, engineer and manufacturer was successful in producing the seemingly impossible, viz: An interior showing to better advantage by artificial light than in daylight.

When the cathedral is finally completed it is planned that the entire nave, crossing, choir and sanctuary will be lighted without a light being in the field of vision. At the present time, as the lighting of the crossing is but temporary, the only part of this elaborate scheme that has been worked out is the lighting of the choir and sanctuary.

On the completion of the cathedral there is no doubt but that it will mark an epoch in the history of artificial illumination. At the present time the choir and nave are lighted by means of strips of continuous Frink reflectors, ingeniously concealed behind the sanctuary piers and over the huge arch. Sixty-eight 16 cp. lamps are used in each of the reflectors installed behind the piers, and 104 lamps in the reflectors fastened to the arch. Behind the choir piers 48 40-watt tungsten lamps in each of the two strips of reflectors flood the choir lofts with light.

So great is the height of piers and arch that is impossible to re-lamp the reflectors by ordinary methods, and an elaborate system has been worked out, whereby any one of these sections of continuous reflectors may by means of a windlass, be thrown on a track and lowered to the floor, where they can be re-lamped, raised and snapped back to their proper position.

The reflectors in the arch are also arranged on a sliding track, but re-lamping is done through a hole in side of vault from where the lamps may be replaced as the reflectors slide back and forth. In the canopies over the stalls for the clergy, the light is thrown through rich, amber glass, giving a soft, mellow light and having a beautiful daylight effect.

The huge crossing is lighted temporarily at present by means of concentrating reflectors, but all the fixtures in the aisles will be replaced, when the cathedral is completed, by others more in keeping.

By means of dimmers the entire installation is arranged so that any degree of brilliancy may be obtained, as often, in some religious ceremony, a dim, religious light is needed, while at other times, if desired, the cathedral can be veritably flooded with illumination.

It is a matter of regret that the majority of us will not live to see the cathedral completed in its beauty by day and its splendor by night.

THE SCULPTURED FIGURES OF THE CATHEDRAL CHURCH OF ST. JOHN THE DIVINE

A feature of the interior of the Cathedral Church of St. John the Divine, as far as at present executed, and one that will attract attention, is the sculptured figures on the chapel exteriors and the general scheme of sculptural enrichment in the interior.

The architectural student, familiar with the figures that form so important a part in

the decorative scheme of European Cathedrals, will study with much profit these later examples.

Chartres and Rheims Cathedrals as well as Notre Dame are famous for their stone carved figures, some of which by reason of their lack of asymmetry and the broad method of their modeling, have served as studies to later workers in ecclesiastical sculpture. The present examples are so well executed, and so fittingly accent the general lines of the composition that the architects are to be congratulated on the artistic result attained.

The art of carved stone has reached a high state of perfection. It has become, in the hands of sculptors and architectural stone carvers more than a conventionalized expression of an artistic motive.

Its suggestion of color and its rare excellence of form, together with its restrained application, all point to a better and saner appreciation of the true meaning of applied decoration. Probably its more general use has been restricted until recent years, for the reason that it has not been possible for the sculptor to find craftsmen sufficiently skilled to transform to the stone that virile spirit that the sculptor has succeeded in imparting to the clay.

For the sculptor to attempt to do this cutting himself would be a physical impossibility and he must needs content him with adding such small finishing work as will correct the errors of ignorant craftsmanship. But it is not to be supposed that it is not possible to find in this country those rare qualities of craftsmanship that are the highest plane of the stone cutters' art.

A critical examination of the sculptured figures on the Cathedral Church of St. John the Divine will show the possibilities of cut stone work. Here we have a series of figures and ornaments, modeled, and reproduced in Frontenac stone by Barr, Thaw & Fraser, under whose direction the sculptors employed on the work made the models from which the stone figures and other ornamentation was executed.

Messrs. Barr, Thaw & Fraser employed in this work the following sculptors: Charles Jensen, J. G. H. Hamilton, C. Price, W. T. Scott, Gutzon Borglum, L. Lentelli and O. Burdett. All of the members of the firm of Barr, Thaw & Fraser are practical men in their craft and each skilled in the highest degree in the working of stone to artistic and enduring forms. More than craftsman in the generally accepted sense, they have demonstrated in the many important commissions that have been entrusted to them, that it is possible to transfer into stone all the essentials of correct modeling that are in the plaster cast with an added artistic touch that proclaims a work of art.

WILLIAM OF WYKEHAM AND MAURICE

The problem of the figures that adorn the chapel arches and the large arch at the crossing are in themselves complex and difficult of solution. Starting from a level of the eye and following the arches to their apex a series of single figures are seen, each viewed from a different angle. To so model and cut these figures that the consequent foreshortening and the varying distances shall conform to true perspective, all require the greatest skill and fine sense of the artistic requirements of so difficult a problem.

As might be expected in view of Barr, Thaw & Fraser's great success in similar undertakings, the result is a beautiful one and fittingly complements the general interior scheme of decoration of this imposing edifice.