VOL. XVII. NO. 1. JANUARY, 1905. WHOLE NO. 76.

THE ARCHITECTVRAL RECORD

CONTENTS

Subscription Yearly, $3.00

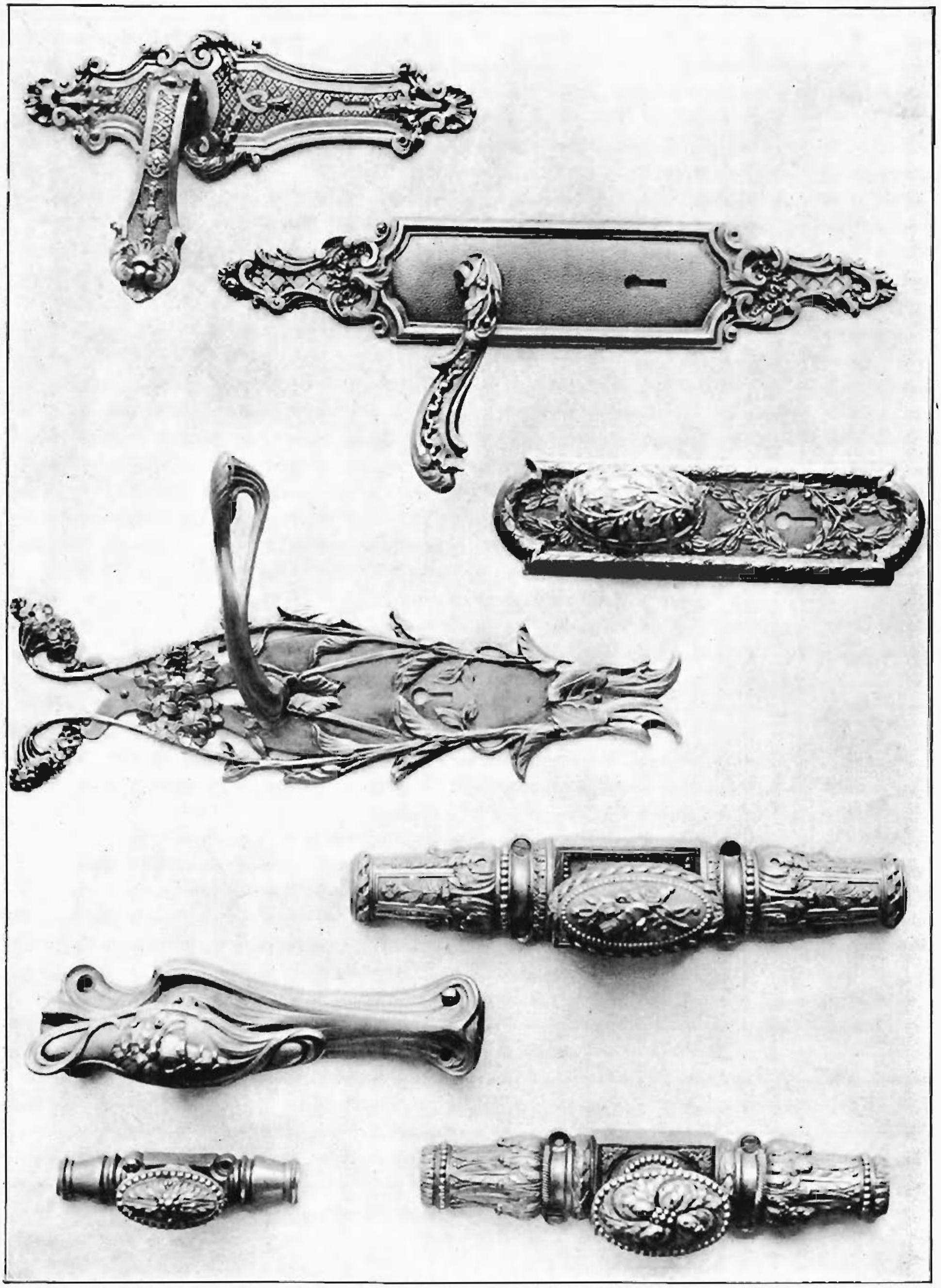
PUBLISHED MONTHLY

TWENTY-FIVE CENTS

THE ARCHITECTVRAL RECORD CO. NEW YORK

TWENTY-FIVE CENTS

OFFICE OF PUBLICATION: Nos. 14 and 16 VESEY STREET, NEW YORK CITY.
WESTERN OFFICE: 120 RANDOLPH ST., CHICAGO, ILL.



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great international fairs are such as the world has never before seen, although even in this commercial age they have not been financial successes; they have been most conspicuously instrumental in the dissemination of taste. From the examples of the best of their buildings down to the humblest cottage built in good design we have an indication of potent forces at work spreading a wider realization of the utility and necessity of art in a finished civilization. Such influences are leading many to feel that we are today standing on the threshold of a new era in art, whose opportuni-

RAMONA'S HOUSE—SOUTH FRONT.

ties, enriched by the heritage of the past, include the greater possibilities of an age advanced in mechanical development far beyond the wildest dreams of its predecessors.

This new art era will nowhere have a more appropriate setting than in Southern California. Nature has here provided for it a background of the rarest beauty. Its distinctive architecture, though at present but vaguely outlined, here as elsewhere, is being sketched in with the erection of every new building of merit. May the completed picture fulfil its present fair promise.

Elmer Grey.

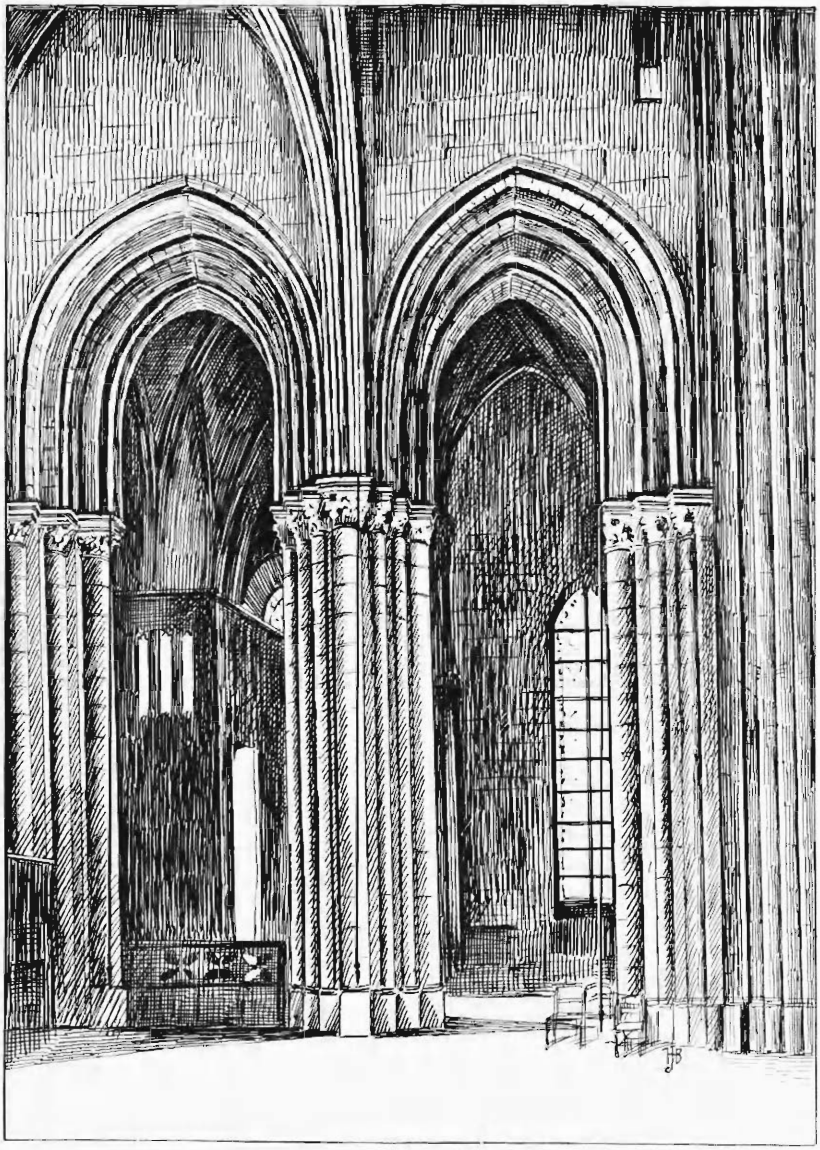

FIG. 1. NOTRE-DAME. VIEW ACROSS THE NAVE FROM SOUTH TO NORTH: NEAR THE FAÇADE. ACCURATE DRAWING FROM THE SURVEY PHOTOGRAPH.

Compare with Fig. 2, in which the same window is seen.

ARCHITECTURAL REFINEMENTS IN FRENCH CATHEDRALS.

Fourth Paper.*

NOTRE-DAME.

IN two preceding papers, the first of which was partly devoted to Notre-Dame at Paris, while the second was wholly devoted to this Cathedral, we have described, first, its system of widening and curving the vertical lines of the nave (November Number), and second, the gallery bends in elevation, together with the constructive deflections from the perpendicular in the east and west direction, of the triforium piers and columns (December Number).

At the close of the last paper we had reached the description of the tower constructions as regards the great piers of their interior angles.

From this description it appeared that these piers lean west about 18 inches in a height of about 80 ft., curving toward the perpendicular in their upper portion. It was also found that the masonry courses of the interior walls, as well as the gallery parapets, are bent downward from the fourth bay (counting from the organ loft), so that they are normal in rectangular direction to the leaning piers. Thus, if any settlement had affected the piers, it must have begun at the fourth bay from the organ loft; but it was shown by the published illustrations and by the photographs in the Brooklyn Museum that no fissures amounting to 18 inches, or of any appreciable amount, have been repaired, either at the fourth bay or at points intermediate between that bay and the piers of the interior tower constructions. The account of these observations is now continued, in the direction of the façade.

Piers of the Tower Constructions.

Fig. 1 of this paper connects with Figs. 1, 3, 4, of the last article, and shows the bays of the nave on the west side of the north tower pier, as taken from the pavement, whereas in the last article the triforium bays on its eastern side appeared in Figs. 3 and 4 of that article (December Number). From these illustrations and from the measurements quoted in connection with them, we shall proceed to develop the facts concerning the tower con-

*Continued from the December Number. The illustrations of these papers are from photographs of the Brooklyn Museum Series of 1903.

structions, which will then be related to the façade construction on the one hand and to the points already made known for the main body of the nave, on the other.

As seen in Fig. 1, the pier of the north tower construction leans 0.44 in about 20 ft. from the pavement, up to the height of the capital, from which the plumb-line is suspended, and its mate has a similar lean. That part of it which is seen in Fig. 3 of the December Number, on the left of the triforium on the north side of the nave, leans 0.20 in a height of 10½ ft. The entire westward lean of this pier and its mate (which leans 0.14 in the corresponding 10½ ft.) from the pavement to the springing of the nave vaulting, is about 18 inches, as just mentioned, and as accounted for in detail in the last paper.

It will be noticed that these companion piers are imbedded in the solid wall on their west sides, from the nave arches up, and it will be remembered that columns which are only 3 ft. distant lean off in the opposite direction: 0.14 in the north gallery and 0.10 in the south gallery, in a height of 10½ ft. The masonry of the walls can be studied, block by block, from pavement to vaulting, in the Brooklyn photographs.

It is a matter of fact of importance that the leans of these piers, which are parts of the tower constructions, are paralleled by others in the corresponding exterior tower buttresses. This appears by referring to the diagram, Fig. 3, and we shall now begin to draw nearer to the exterior tower construction.

To return to Fig. 1, we have so far confined our attention to the pier on the right of this picture. We now include in our account, and in its illustration, the pier in the centre and the pilaster on the left, which is engaged in the wall of the facade. The leans, of the same amount as just quoted for the right-hand pier (0.44 in about 20 ft.), continue, and we shall presently find this lean repeated on the façade exterior.

It was in the last few days of my stay in Paris that the exposure represented by this drawing was made. During the forty-five minutes which the exposure required, while standing near the camera, glancing carelessly about, it suddenly appeared to me that the pilaster which is engaged in the side wall, and which projected, in that particular line of vision, slightly beyond the central pier (as it does in Fig. 1), and which was otherwise mainly concealed by it, was accurately in line with its inclination. When this observation was tested by the plumb-line, it appeared that both of the pilasters,* which are engaged in the side wall, and which are in no wise exposed to any east and west masonry movement, exhibit parallel leans, with measurements corresponding to those already given.

*Such pilasters are technically known as "responds."

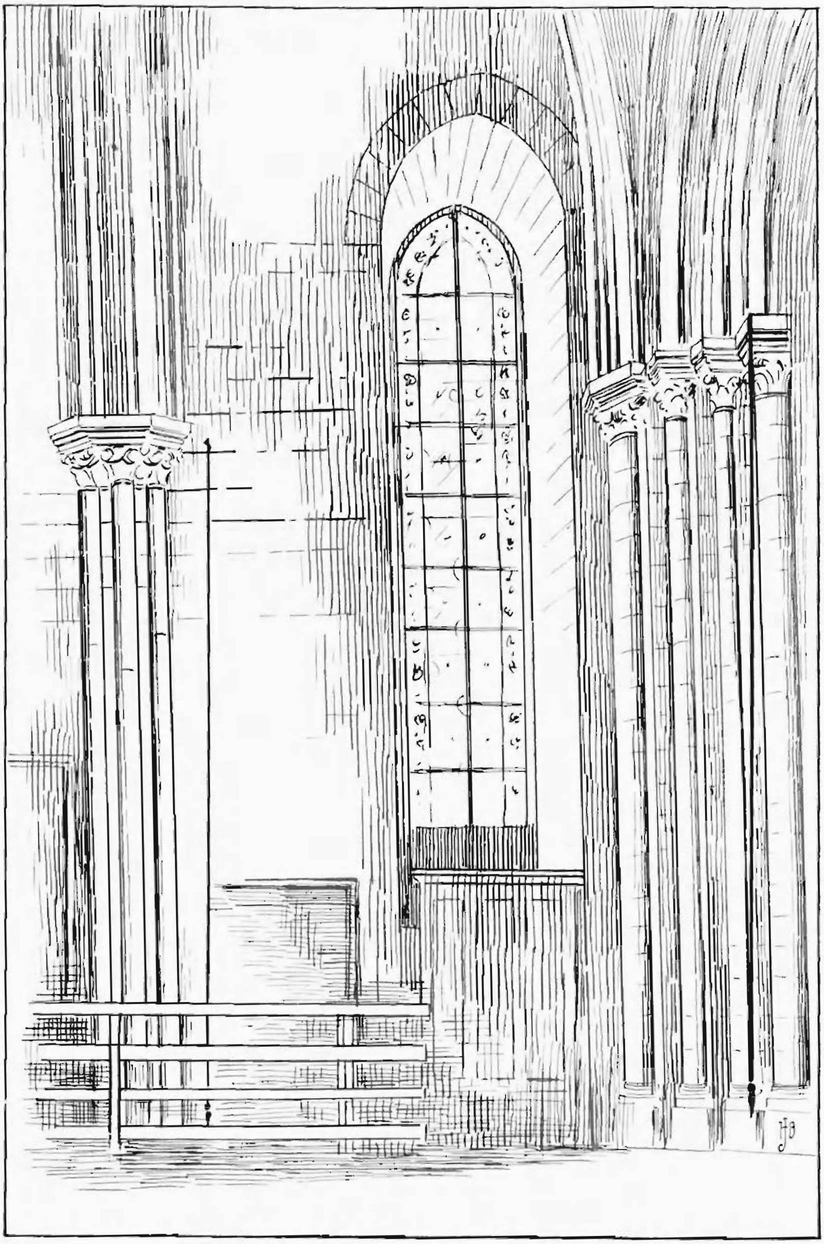

FIG. 2. LEANING WINDOW AND LEANING ENGAGED PILASTERS. LEFT AISLE OF NOTRE-DAME, NEAR THE ENTRANCE. ACCURATE DRAWING FROM THE SURVEY PHOTOGRAPH.

Compare with Fig. 1, in which the same window is seen.

These leans are also found in the construction of the windows, one of which appears, with both pilasters, in Fig. 2. The other window, farther to the left is included in one of the Brooklyn exhibits. These arrangements are found on both sides of the church.

Two enlarged photographs, each 18 in. by 22 in., are to be seen in Brooklyn, verifying the facts as shown in Fig. 2.

These astonishing phenomena demonstrate the same subtle purpose of concealing or obscuring the primary leans, which has already been described, for the transepts of Notre-Dame and Amiens in the November Number. It will be remembered that a similar device has been found at St. Quentin, and that it has been illustrated in publication for St. Loup at Chalons in the August Number. It should be added, however, that the concealment here in question may be related, with equal or greater probability, to the leans of the exterior buttresses, with which these windows are immediately in contact, as we next proceed to show by Fig. 4.

The Towers.

It was several days earlier that I had photographed the leaning façade (Fig. 5),* but I had not, up to this time, observed that the towers repeat this inclination.

Fig. 3 scarcely exaggerates the facts, which are accurately represented, as regards the amount of pitch, in the lower façade, in Fig. 5. The pitch of the main front, up to the Gallery of Kings, is repeated in both buttresses on the sides of both towers, as well as in the projecting abutments between them, which contain the tower stairways. These, however, curve toward the perpendicular (just as the interior piers of the tower construction curve toward the perpendicular, and just as the façade also appears perpendicular above the Gallery of Kings). The towers strike the true perpendicular at the point where they separate from the façade, just above the line of the eaves of the roof.

The pitch and the curve of the tower buttresses are shown by four large photographs in the Brooklyn Museum. Two of these are reproduced in Figs. 4 and 6. These photographs include, of course, the exteriors of the leaning windows, which are shown by Fig. 4. They also connect with a photograph of 2 by 3 ft. dimension for the leaning façade, from which Fig. 5 has been taken.

Before turning to the façade we once more specify the probability that the leaning windows, which are directly adjacent to the tower buttresses, were given the same pitch as a device of concealment for the exterior pitched and bending lines. (See Fig. 4.) The

*It should rather be called a bending façade, as the lean bends to the perpendicular higher up.

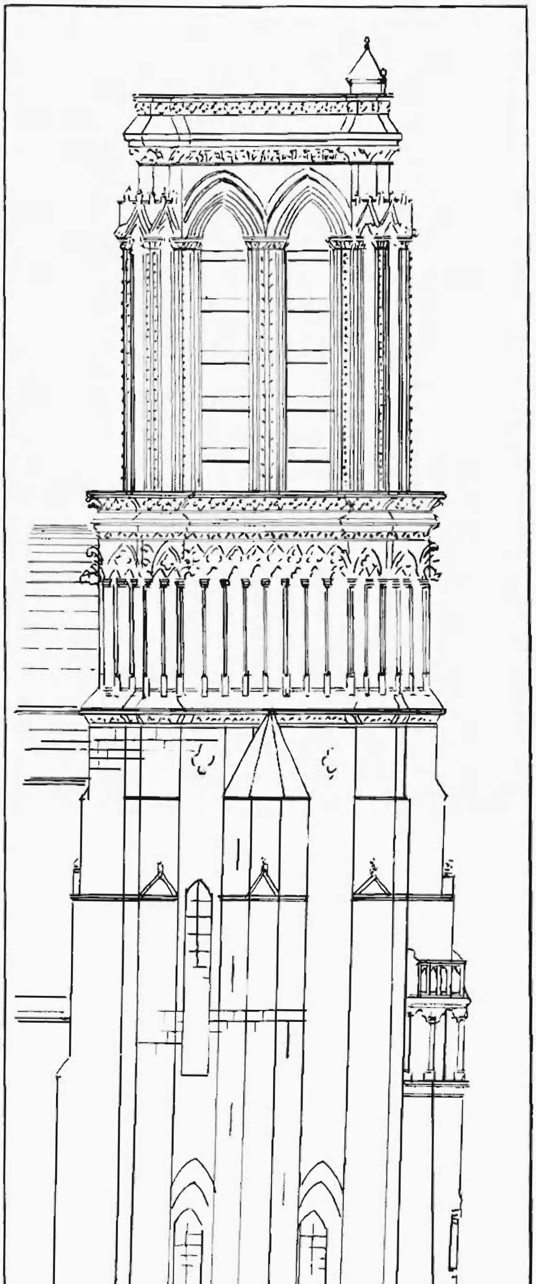

FIG. 3. VERTICAL BEND OF THE NORTH TOWER OF NOTRE-DAME. SLIGHTLY EXAGGERATED DRAWING.
Compare with Fig. 6.

interior wall pilasters may have been inclined to correspond with the windows as well as with the interior piers.

The Façade.

The forward pitch of the façade, up to the Gallery of Kings, is about 11 inches in about 40 ft. The pitch of the buttresses on the sides of the towers is the same, modified by a curve toward the perpendicular above the level of the Gallery of Kings.

The suggestion of settlement is inevitable, and is met, to begin with, by all the explanations which have been advanced in the last article and which have been re-summarized in the opening of this paper, regarding the bends of the gallery parapets and of the interior masonry courses at the fourth bay from the organ loft (sixth bay from the entrance). If the facade went over to the west there must have been fissures in the masonry. These fissures must be sought where the settlement began. If any settlement took place, it began at the sixth bay from the entrance (see December Number), because the interior masonry courses slope downward in a direction normal to the leans of the piers, from that point. In Fig. 1 of this paper observe also this same slope above the arches, and the lowering of the westernmost arch which is connected with this slope. The theory of settlement is, therefore, forced to demonstrate that the bases of the interior responds (or engaged pilasters) at the facade, and the corresponding base mouldings of the exterior facade have sloped downward to a corresponding amount. (I have shown by the measurements in the December Number that the pavement does not slope, because the bend of one gallery parapet was measured by level in the gallery, and the bend of the other gallery parapet was measured by plumbing to the pavement.)

As the spires are perpendicular (see Fig. 6 and compare Fig. 3), the façade and the lower tower constructions must also have settled before the spires were constructed, which seems improbable. In fact, so many bending façades are now known that it somewhat taxes one's credulity to believe that they have all settled before the weight was added which might have caused a settlement, and that no records have survived of these curious accidents, which were never repeated after the load was increased. It is also incumbent on the sceptic to explain how the side buttresses of the towers could have settled in curves. This is surely pushing the theory of plastic masonry to an absurd extent. In Fig. 6 the camera is too far to the left, and the view is too small to show these curves. The fact of the lean with return bend to the perpendicular is, however, easily apparent in this view.

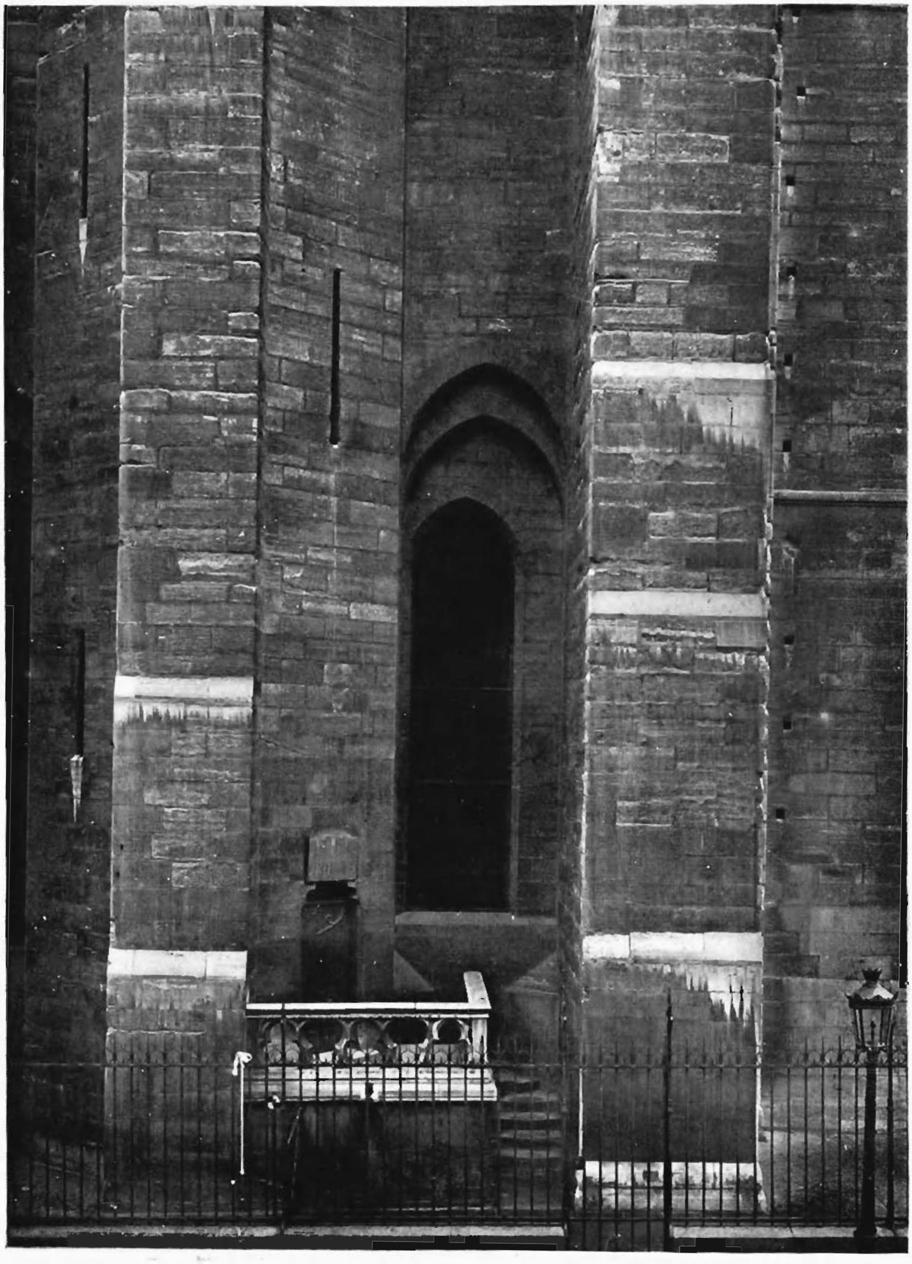

FIG. 4. NOTRE-DAME. DETAIL OF THE EXTERIOR NORTH TOWER CONSTRUCTION.
Compare with Fig. 3 and Fig. 5. Note the window ledge as level.

FIG. 5. THE LEANING LOWER FAÇADE OF NOTRE-DAME.

Note the plumb line. Note the cornice under the Gallery of Kings as rising from left to right instead of sloping downward, as would be the case if a settlement had occurred.

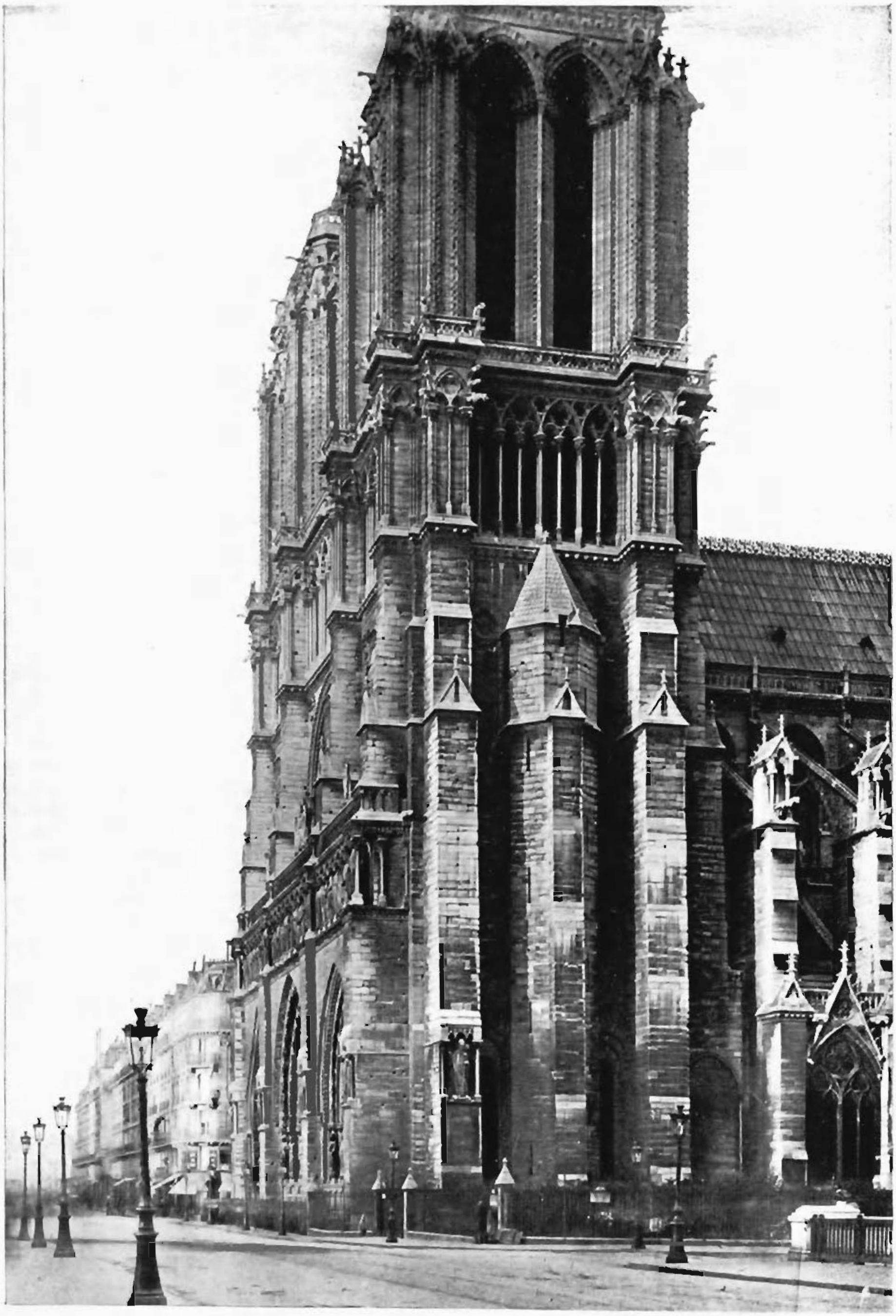

FIG. 6. THE TOWERS AND FAÇADE OF NOTRE-DAME; FROM THE SOUTH.

By sighting from the base of the picture the bend, by which the construction of the south tower is brought into perpendicular, can be easily perceived.

In Fig. 4 we notice that the window sill is level, and therefore constructed obliquely with reference to the leaning vertical sides. This is shown with great clearness in the 2 by 3 ft. enlargement from the same negative in Brooklyn (No. 102). If the tower had settled the window sill would dip downward to the west.

In Fig. 5 we reach a crucial observation, regarding the cornice which marks the beginning of the Gallery of Kings, and which is carried around the side of the north front buttress. It will be noticed that it does *not* slope downward towards the west, as it would if a settlement had taken place. It rather rises slightly, and so do the masonry courses directly under it. In Fig. 6 we notice that the same construction holds of this cornice on the south side of the south front buttress. Although the dimensions of this picture are rather small for the observation of this fact, it is more clearly shown in details for the south side of the west front, of the Museum series of 5 by 7 prints (Nos. 206, 208).

Special attention should be given to the plumb-line suspended against the side of the buttress near the centre of the picture in Fig. 5. The column directly over it is perpendicular, and so are the other corresponding columns above these buttresses. In other words, the bend of the façade begins at this point. This is much more clearly shown by the enlargements in Brooklyn. The bend to the perpendicular is also well shown from the south side in No. 204 of the Museum 5 by 7 prints.

The second story of the west front (which includes the rose window) steps back from the lower front (as shown by Figs. 6 and 7). We can, therefore, understand that no risk of stability was involved in the lower lean. My observation of this second story is that it is closely perpendicular, like the columns of the Gallery of Kings, but I had no time to verify this observation by plumbs or special photographs.*

The multiplication of arguments on the question of settlement hardly seems worth while, and it may even seem to indicate want of confidence in separate individual demonstrations, any one of which ought to be sufficient. However, modern prejudice is so inveterate in these matters and antiquarian timidity is so natural in the acceptance of revolutionary facts that we may draw attention to one more point.

Viollet-le-Duc has long since overthrown the wholly unsubstantiated idea that piling was ever employed in the foundations of

*My time was so limited for the completion of these observations that the negatives for Fig. 4 and several companion pictures were taken after five o'clock on the day before sailing from Boulogne. It is for this reason that the plumb-line which establishes the perpendicular in Fig. 4 is suspended from the railing outside the towers instead of from a window. The tower was closed at five o'clock, so that it could not be entered for the suspension of a longer plumb-line, and I sailed from Boulogne the next morning.

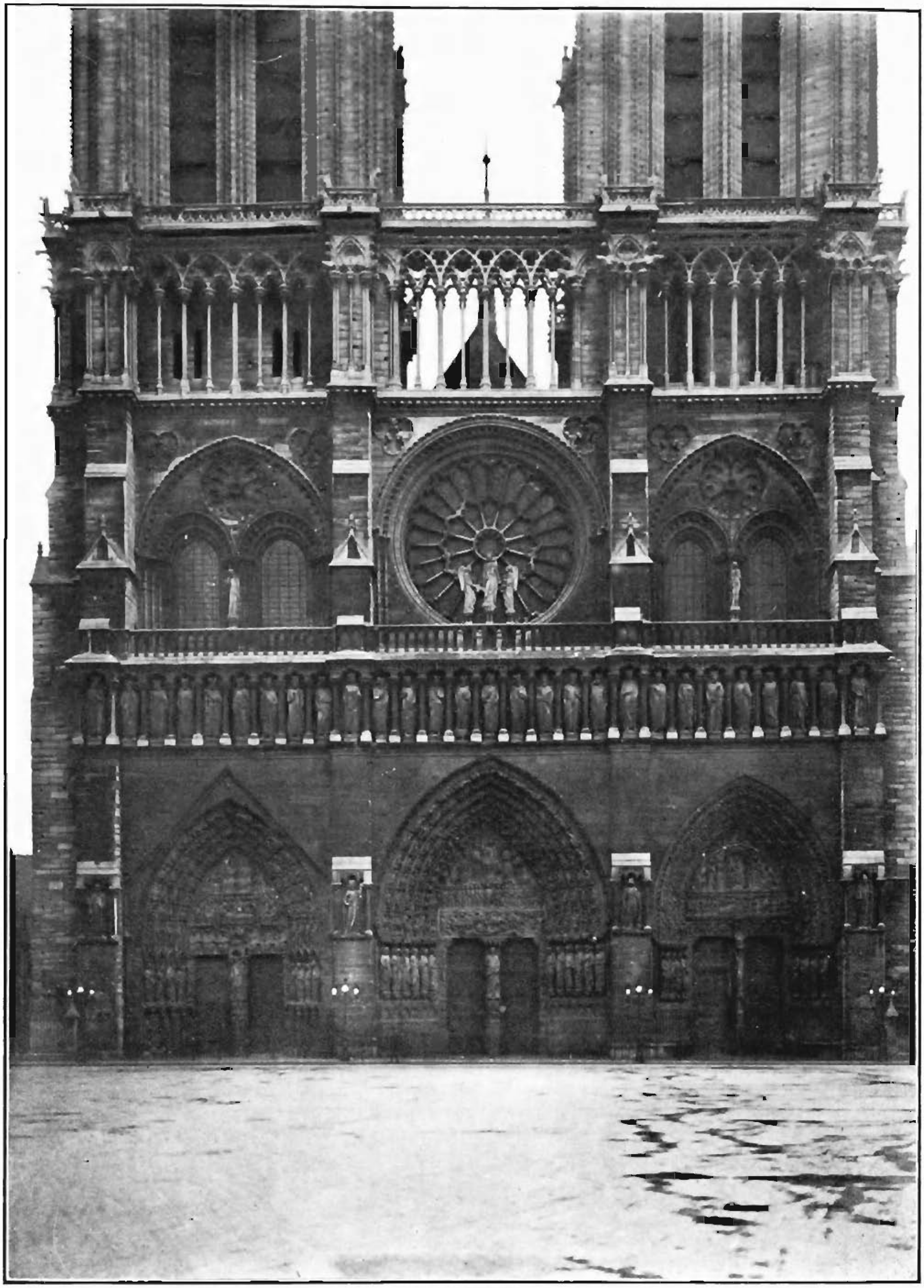

FIG. 7. THE FACADE OF NOTRE-DAME.

View showing, in the upper galleries, the appearance of a bend in elevation, which is an optical effect of the bend in plan which is seen in Fig. 8.

Gothic cathedrals. He has also carefully examined and illustrated the extraordinary, elaborate, and costly precautions which were taken in laying the foundations of the Cathedrals of Amiens and of Paris. In face of these well-known facts about the foundations of Notre-Dame, the settlement theory has to face the fact that the settlement began, if at all, not under the weight of the towers, but at the sixth bay from the façade; that in a distance of some 80 ft. from the sixth bay to the façade this settlement must have amounted to some 18 inches. For if the piers went over 18 inches in a height of 80 ft. the corresponding settlement between the sixth bay and the façade could not have been less than 18 inches in a corresponding distance of about 80 ft. (The actual distance from the façade to the beginning of the sixth bay is close to 90 ft.)

The settlement theory has also to meet the difficulty that, as the columns of the Gallery of Kings are perpendicular, and as the spires of the towers are also perpendicular, it is necessary to prove that the massive foundations could not withstand an ordinary and inconsiderable load, and that, after yielding to the weight of this inconsiderable load, they have subsequently resisted successfully the weight of the much greater load which was subsequently added.

So much has been said in earlier publications on the subject of bending façades that we may shorten the discussion of purpose here, but it is important to press the point that, in three separate instances, certificates have been published from the engineering experts in charge of the buildings, verifying the arrangement as constructive and intentional.

The bending façade of the Pisa Cathedral was very carefully published, as regards surveys and constructive proof, in the Architectural Record for March, 1898; Vol. VII., No. 3, in an essay entitled "The Problem of the Leaning Tower of Pisa." The certificate regarding this facade was published in the Architectural Record for October, 1902, and also in Museum Memoir No. 1. Both articles were entitled "A Renaissance Leaning Façade at Genoa." These publications also contain, besides this certificate and another from the architect in charge of the Genoese church of S. Ambrogio, illustrations and measurements for the vertical bends in the façade of St. Mark's at Venice. The certificate from the architect then in charge of St. Mark's was published in Museum Memoir No. 2, and in the Architectural Record for November, 1903; Vol. XIV., No. 5. These various publications include mention of a series of other similar constructions, with illustrations and measurements.

Explanations as to motive must naturally be based on the obvious results of such arrangements, and on their analogies with other constructive subtleties. To throw forward the lower portion of the façade is to improve the effect of its decorative details, by diminishing the appearance of foreshortening. It also increases the apparent height to a very considerable extent, in case of near approach. In quartering views, or side views, the bending line is also artistically superior to the straight line.

It also appears probable that all inconspicuous variations of architectural lines from the position or direction in which the eye naturally expects to find them, tend to produce an illusive optical vibration or mystification which is conducive to an effect of "life."*

Notre-Dame varies from hitherto published examples of bending façades in uniting a system of westward leans in the interior with this exterior peculiarity. The Italian churches which have the bending façades have no connected spires or towers, and no other instance of a bending line in towers has, so far, been observed in France. The west façades of the other French churches which were visited in 1903 appeared to be generally normal, with the following exceptions:

Notre-Dame la Grande, at Poitiers, has a façade with delicate lean and return curve to the perpendicular (No. 112 of the Brooklyn Catalogue and exhibit). The Renaissance façade of the Gothic Cathedral of St. Malo has a constructive lean of about 5 inches in 50 ft. This was first made known to me by Commander Hugh D. Rooper, of the British Navy. I made a trip to St. Malo to verify the observation. The Sainte Chapelle, at Paris, which has no interior refinements, has a well-defined constructive forward inclination of about a foot in a height of about 38 ft., with return bend to the perpendicular. Several good negatives were made of it, but no enlargement has yet been exhibited.

The best analogies with the Notre-Dame façade, so far known, are those which are offered by the Italian examples—the Pisa Cathedral, St. Mark's at Venice, S. Michele at Pavia, S. Ambrogio at Milan, and other buildings, as previously published.

Bend in Plan of the Gallery of Kings.

In Fig. 7 the reader is requested to note the horizontally bending line of the uppermost parapet and gallery of the façade (the one which unites the towers over the arcade of columns and arches). On the left side of the right (south) tower the parapet changes

*M. Choisy's "Histoire de l'Architecture" uses the following words in his account of the effect of the Greek deflections from rectilinear building: "Que l'on en ait ou non conscience, il resulte de cet allure inusitée des lignes une impression étrange et neuve. Non averti le spectateur sent quelque chose d'insolite; averti, il reconnait une attention delicate qui le charme; les contours prennent, grâce à cet recherche, un air de distinction auquel le goût ne saurait demeurer indifferent: l'édifice echappe à l'aspect vulgaire des constructions à lignes rigides, il s'empreint d'un charactère imprevu et neuf qui se soustrait peut-etre à l'analyse mais nous saisit alors même que nous en ignorons le vrai sens et la cause."

direction, and becomes slightly oblique, rising from left to right. On the right side of the left (north) tower we notice another change of direction, and the parapet returns to the horizontal or inclines slightly below it, from right to left. In the parapet next below we see the same changes of direction. In the still lower gallery, the Gallery of Kings, these deflections are not visible in the given photograph. If, however, we came nearer to the building than the camera was placed when this photograph was made, we should begin to see a similar bend in the Gallery of Kings, while the bends of the upper galleries would become much more strongly defined, the uppermost being always the strongest. As we move farther back from the building, the bends will diminish and tend to disappear. They will disappear entirely from any point of view which is exactly level with the given gallery.

These bends are an optical illusion. They do not exist at all as the eye sees them, or as the photograph—No. 7—represents them, and the eye perceives them in varying strength according to the height of the given gallery, and according to the distance of the spectator from the façade.

These apparent bends in elevation are all produced by a bend in plan of the façade, which begins in the Gallery of Kings, and which amounts to 1.20 (Fig. 8). This bend continues throughout the entire façade in all its upper faces and stories, and may be noticed by the visitor as having the same actual amount in each successive gallery.

In optical effect the bend in plan produces, when viewed below its own level, the effect of a bend in elevation. At an angle of 45 degrees an advance, from right to left, of 1.20 in the middle vertical section of the façade, produces the effect of a rising obliquity from right to left of the same amount. At an angle less than 45 degrees, that is, at a greater distance, the obliquity decreases. At an angle greater than 45 degrees, that is, in nearer approach, the obliquity increases, in geometrical ratio to the amount of change in the angle.

Wave lines, in elevation, of alignment in pilaster capitals or in the capitals of columns, are occasionally found in the Pisan Romanesque. They occur on the exterior sides of the Pieve Nuova, at S. Maria del Giudici, near Lucca, and in the north wall of Pisa Cathedral. There is a wave line of columnar capitals to be noticed in the south gallery at Pisa. Wave lines of plan in interiors have been published for the Fiesole Cathedral (Architectural Record, Vol. VI., No. 4, p. 488). They exist in St. Ouen at Rouen, and in the Cathedral of Lyons.

Curves or bends in plan, when seen laterally above or below the level of the eye, are frequently translated optically into deflections

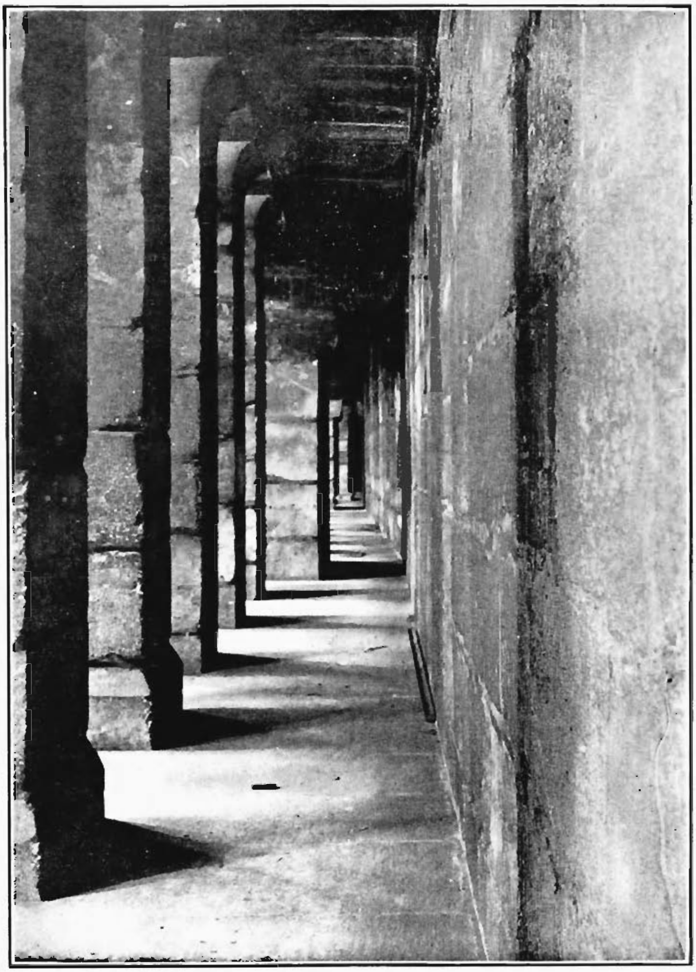

FIG. 8. INTERIOR OF THE GALLERY OF KINGS, NOTRE-DAME.

View looking North and showing a double bend in plan, which is repeated in the upper galleries.

in elevation, rising or falling in elevation, according to the position of the spectator and according to the direction of the deflection. It appears very improbable that these effects should not have been familiar to mediæval builders.

The artistic value of such deflections will appeal to many, without farther explanation, but such explanation may be offered presently, and with relation to the following additional instances of asymmetry in Notre-Dame.

Gallery Curves in Plan.

The galleries of Notre-Dame curve in plan. The left (north) gallery curves concave to the nave. The right (south) gallery curves convex to the nave (Fig. 9). This curve is repeated, with the same amount of deflection, in the gallery wall, in the vaulting of the gallery (Fig. 9), and in the clerestory wall, which rests on the triforium piers and columns. Fig. 10 shows the outside of this clerestory wall, and the stone roofing slabs which cover the vault of the gallery below. The curve reappears in these slabs as a bend, which is very clearly shown by the photograph.

The amount of this curve, as indicated by the surveyor's rod, which lies across the tape, in Fig. 9, is 9½ inches.

In the left (north) gallery the curve of the outer wall is inconspicuous. The stationary benches which fill the gallery made it impossible to photograph the stronger curve in plan concave to the nave, in the parapet bordering the nave.

Notre-Dame is thus found to be once more similar to the Pisa Cathedral, for the Pisa gallery parapets also curve in plan, besides bending in elevation (Architectural Record, Vol. VII., No. 1, p. 87). Such curves or bends in plan are also especially interesting in the string-courses above the arcades in the Cathedrals of Siena and Cremona. They produce the optical effect of curves or bends in elevation, either rising or falling, as the case may be. Thus I was led into the error of announcing bends in elevation in the clerestory string-courses at Cremona, after observations in 1895, which were corrected in 1901, when it turned out that the bends were actually in plan, although giving the illusive effect, which was announced as a reality.

The Deflected Choir.

The deflected choir of Notre-Dame is shown by the plans of the folio "Monographie de Notre-Dame de Paris," published by Morel, but the gallery curves are not included in these plans. The deflected choir is ascribed by the text, as is usual in such cases, to

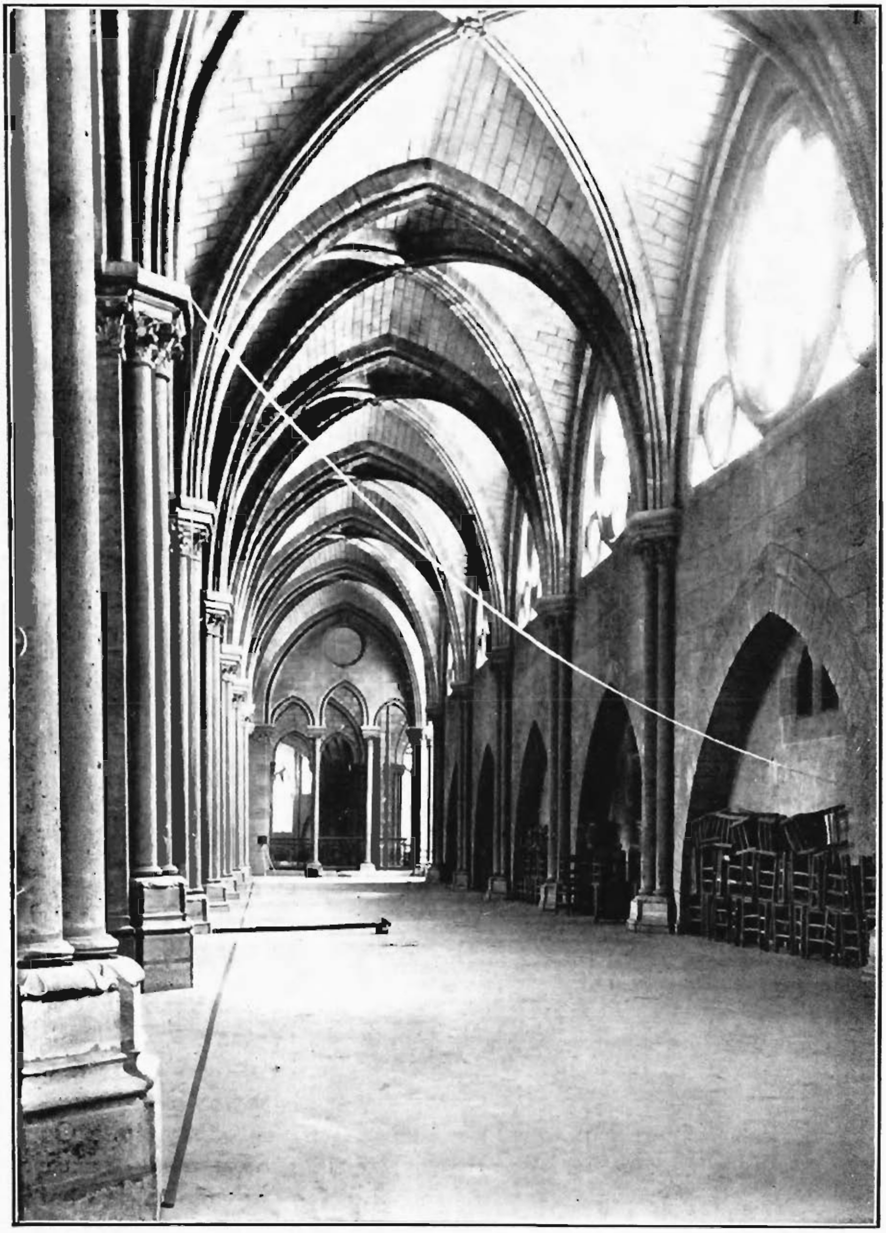

FIG. 9. NOTRE-DAME. SOUTH GALLERY, LOOKING EAST.

View showing a curve in plan of the alignment of piers on the left, which is repeated in the exterior parapet of the nave, in the ceiling of the vaulting, in the exterior wall, and which reappears in the bend of the roofing slabs above the vaulting. See Fig. 10.

the symbolical representation of the bending of the head of the Saviour on the Cross.

It has been elsewhere shown* that the asymmetric plans of Italian churches present many phases which have no relation to the plan of the Cross, and frequently do not even include it. I have also suggested that the sentimental or symbolic explanation above quoted, which is not mentioned by any mediæval record, and which is not verified in any other way, may either be a modern invention or a traditional explanation, originally given by some individual master-mason (or habitually given by master-masons) as pleasing to the clergy, and saving the trouble of æsthetic explanations.

The constructive intention of the deflected choirs has rarely been doubted by antiquarian authorities. It is the only phase of intentional cathedral asymmetry which has so far been generally recognized and published. In optical results it develops the same effects of picturesque variety, of mystery, and of illusive optical vibration which hold of other distortions of plan and of elevation, and which are only symbolical of artistic good sense.

Although the explanations of Choisy and Viollet-le-Duc both suggest accidental causes, this appears to be the result of their conviction, with which I thoroughly agree, that symbolism is not the explanation. Hence they naturally chose the only alternative explanation which had so far been offered. Both of these authorities have otherwise expressed their constant confidence in the scientific knowledge and engineering ability of the mediæval builders (note the quotations from M. Choisy in this paper farther on). It may be that M. Choisy might modify his previous views, after considering the plans and arguments which I have published in the Architectural Record, Vol. VI., No. 3, for 1897, "Constructive Asymmetry in Mediæval Italian Churches."

The Point of View.

As the magazine publications of the current, and three preceding, numbers may find readers who have not been previously familiar with the subject of cathedral asymmetry, it is desirable not to confine these publications wholly to bare descriptions, without reference to the philosophy or possible explanations of the phenomena. For this reason readers who are familiar with the earlier publications must excuse some repetition of points presented in them. On the other hand, those who are new to the subject must excuse brevity and a rather summary disposal of the question as to what all these facts really amount to, because in many publications, both in and outside of this magazine, this question has already been fully considered for other buildings.

*Architectural Record, Vol. VI., No. 3, p. 405.

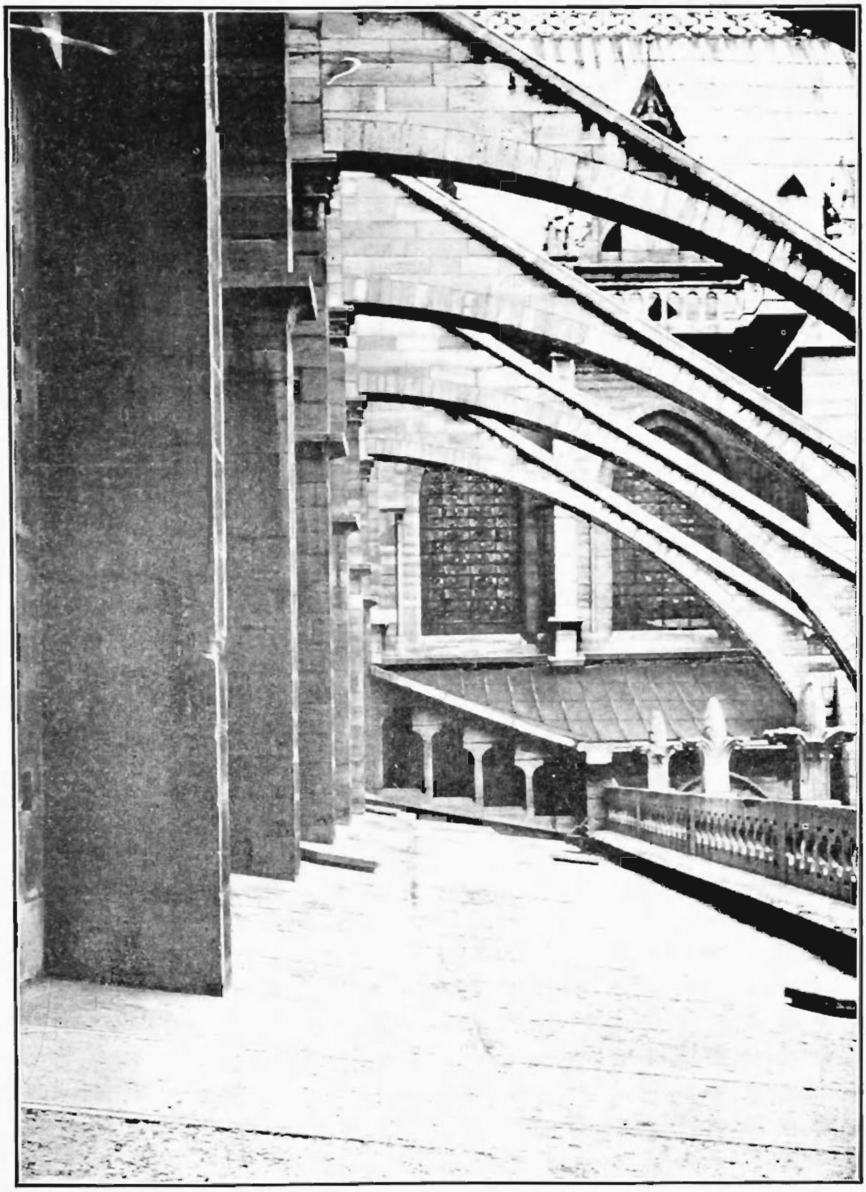

FIG. 10. NOTRE-DAME. ROOF OF THE SOUTH GALLERY, LOOKING EAST.

View showing a bend in plan in the roofing-slabs, which corresponds to a curve in the wall and in the alignment of buttresses. This is a continuation of the interior curve shown by Fig. 11.

It is, however, probable that the present publications for Notre-Dame will draw additional students into this field of interest, and that it will begin to assume larger proportions in antiquarian estimation, when it is found that Italian buildings are not the only ones involved. Hence the preceding matter-of-fact account of the extraordinary constructive phenomena of Notre-Dame may be considered as really demanding some rehearsal of the whole matter involved.

Philosophy of Architectural Refinements.

Modern architecture has, since the close of the sixteenth century, gradually drifted into a mechanical formalism of mathematically exact symmetry and of monotonous repetition of details, which contrasts very unfavorably with the work of older periods. This older work was very largely dependent upon accidental conditions and causes for its more spontaneous, more varied, and more picturesque character. The difference between old and modern work is largely determined by changes in social organism and business system, which have eliminated the accidental element.

Aside from this accidental element, the builders of the Middle Ages frequently practised predetermined and carefully considered constructive arrangements, which were intended to make their buildings more imposing, more attractive, and more interesting to the eye. The philosophy or substance of this attractiveness is essentially the same as that which inheres in the accidental element, and is similar to that which inheres in the necessary irregularities of hand-work, as contrasted with machine work.

The great subtlety and extraordinary constructive skill and forethought which are frequently displayed in these arrangements, when considered in connection with their inconspicuous and really unobtrusive character, justify us in applying the term of "architectural refinements" to these arrangements.*

In certain cases optical effects were undoubtedly studied by these arrangements, such as an illusive perspective in the apparent distance of the choir, or the avoidance of a contracted appearance in the upper part of church interiors.

In other cases, as in the remarkable arrangements of the south and north walls at Pisa, or in the galleries of Notre-Dame, it may be a debatable point how far optical effects were studied or how far the simple principle of the agreeable and picturesque effect of varied arrangements may serve as explanation. In such cases the debate is largely one of the use of words, or a debate as to how

*See the article on "Refinements," by Mr. G. L. Heins, in the "Dictionary of Architecture," edited by Dr. Russell Sturgis, and published by Macmillan.

far artistic intuition and inspiration may have taken the place of a knowledge of optical laws or a deliberate calculation of optical effects.

As a matter of fact, wherever the main lines of a cathedral are distorted in such a way that the distortion is not obtrusively obvious, and is not inevitably detected by the wandering eye, there must be an optical mystification, which adds to the interest of the building.

It appears to be a self-evident proposition, that where distortions were laboriously and carefully constructed, they must have had a purpose.

It appears also to be a self-evident proposition that the effects which were undoubtedly obtained were the effects which were proposed, provided intentional construction be proven. As to the language which is used in describing those effects, it matters little. The buildings which exhibit them have long been praised as models of architectural beauty and power. The character of those buildings is not changed because some additional measurements have been taken and some additional photographs have been made, from special points of view or of specially accurate character.

Such photographs have very much the same relation to the buildings as the isolated pictures of a vitagraph have to the entire motion which they aid in representing. It is especially to be urged upon new-comers in this topic that the effect of the photographs on the eye is quite apart from the effect on the eye of the arrangement which the photograph represents. It inheres in the dimensions of a photograph that the eye seizes the entire arrangement at one glance, whereas it inheres in the dimensions of the building that the arrangement as a unit is overlooked, because it is perceived by a succession of glances. Thus the photograph serves as an excellent detective, but for that very reason it fails in showing the effect of the arrangement which it represents.

In a multitude of cases the photograph makes conspicuous, and therefore ineffective, the really delicate device of the original building.

I have frequently found it difficult or impossible to persuade those who are inspecting certain photographs or plans, that the arrangements represented are not instantly obvious, and consequently ineffective, in the original buildings. As a matter of fact, a choir deflection of 13 ft. is habitually overlooked at Cremona, so is a narrowing in plan of 23 ft. in S. Stefano at Venice. A diminution of pier spacings to the extent of 13 ft. is wholly inconspicuous in Sta. Maria Novella at Florence.

And yet representations of these facts by plans appear very abnormal. A photograph showing the perspective illusion at Piesole (dropping of arches 3 ft. toward the choir) appears equally abnormal, although the facts are uniformly overlooked in the church.

How easy it is, then, to realize that the widening of St. Mark's at Venice (3 ft.), or of Amiens Cathedral (3 ft.), or of Notre-Dame (2 ft. at the transept), should be inconspicuous in the original buildings. The taste which rebels at constructive asymmetry is really a taste which only rebels at the abnormal appearance of the plans and photographs.

No personal distaste or dislike can be considered of importance in regard to the inconspicuous distortions of mediæval cathedrals, because the buildings themselves have been objects of unqualified admiration to the greatest critics. The character of these buildings is not changed because we understand better than we did the explanation of their enticing mystery. In spite of Mr. Ruskin's weakness as an authoritative architectural historian and critic, his luminous and convincing rhetoric in the "Lamp of Life" will always be a standard reference for the spirit which inspired the asymmetric arrangements of mediæval building.*

Notre-Dame as Compared With Other Cathedrals.

The philosophy of this investigation may be simply stated, as has just been done, but one cannot avoid a feeling of stupefaction, or it may be even difficult to avoid a feeling of profound incredulity, in face of the phenomena of Notre-Dame. As connected with others previously published, they imply a more profound and more destructive revolution in the transition from the Middle Ages to modern times than has hitherto been realized. Hence, my own disposition is to insist upon the evidence for the constructive facts, and to allow these facts to force their own inevitable conclusions. Wonderful as the phenomena are, the only point really to be debated is whether they are constructive. The interweaving and character of the evidence on this head appear to be solid and sub-

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*M. Choisy's "Histoire de l'Architecture" also contains several inspired passages on the philosophy of mediæval asymmetry, from which we select the following:

"Ce prejugé qui confond l'harmonie avec l'uniformité est le fait des architectures vieillies; les architectures jeunes et vivantes qui croient a leurs principes, ne connaissent pas ces compromis." Vol. II., p. 340.

"Ces irregularites sont visiblement intentionelles. Il en est qu'il faut mettre au compte des malfaçons. Entre les unes et les autres la distinction est parfois delicate; mais si l'on songe à l'esprit chercheur, presque subtil des architectes gothiques, on demeurera convaincu qu'il y eut plus souvent calcul que negligence." Vol. II., p. 410.

"D'une maniere génerale, les architectes du moyen age évitent la froide regularité; S'ils admettent pour l'ensemble un parti symétrique, ils savent rompre la monotonie par des détails qui se diversifient à l'infini."

"Notre-Dame a sur sa façade trois portes elevées en meme temps; de celle de gauche a celle de droite les effets de masse seuls se ponderent; à chacune une physionomie distincte."

"Ces differences donnent à la composition une varieté qui a son charme, une sorte de sympathie nous attache à ces œuvres où l'auteur a dedaigné la trop facile resource des poncifs, ou chaque partie a coûte une étude à part, un travail individuel; au lieu de symetrie, il y a ponderation, et l'unite d'impression n'y perd rien." Vol. II., p. 412.

stantial. There is, however, a disposition of the human mind which, in face of what appear to be even absolute certainties, will still withhold final assent, because no counterparts of the phenomena are known. It is therefore necessary to refer, as has been done, to earlier publications for other buildings. The territory which has been covered by these investigations is limited when the whole of Europe is considered, but there are two other churches so far known which are not less remarkable than Notre-Dame for the variety and subtlety of their asymmetrical arrangements. The facts which hold of the Pisa Cathedral and of St. Mark's at Venice have been elsewhere described at considerable length. As regards the individual features of asymmetry in Notre-Dame, these have, generally, individual counterparts of considerable number in other mediæval churches.

Wm. H. Goodyear.

BROOKLYN MUSEUM EXHIBIT AT THE BOSTON PUBLIC LIBRARY OF PHOTOGRAPHS OF ARCHITECTURAL REFINEMENTS;
APRIL 21ST—MAY 15TH, 1904.

SHOP OF THE HAVANA TOBACCO CO.

Photo by Arthur Hewitt.

St. James Building, New York City. McKim, Mead & White, Architects.