The
Architectural Record.

VOL. XVI. NOVEMBER, 1904. No. 5.

THE WORK OF MESSRS. COPE & STEWARDSON.

THERE are two names that must remain forever writ large in the annals of American architecture—John Stewardson and Walter Cope; and this not only because of the work they did, the influence they were partially instrumental in establishing, the peculiar attractiveness of their personalities, but as well by reason of the tragic elements in the history of the firm that linked its founders in a common destiny.

In writing of the work of Mr. Day and his brother,* I have spoken of the merciful Providence that raised up at one time and in so fitting a place four such men as Mr. Eyre, Mr. Day, Mr. Cope and Mr. Stewardson. A more desperate crisis could not have existed, nor could the opportunity have been better improved, than actually befell. Against enormous odds, four men won a final victory, overthrew an enemy strongly intrenched in prejudice and indifferentism, established a new dispensation of "sweetness and light," and raised up a circle of enthusiastic and able followers. Then two of the four went to their reward, and those who knew them, know that it was good. How penetrating had been the personality of these men, how vital their inspiration, how sound their principles we know from the fact that death in no wise lessened the power of the great reformation, that to the two of the first four remaining have been added the successors of those who died and as well the many who, once within the influence of the first reformers, have remained faithful to their inspiration.

In a way, the work of John Stewardson and Walter Cope was accomplished. Had they continued for another quarter of a century they would have built many things far more beautiful than what they had already done, as will their successors, we surely believe; but these new monuments would have been but added joys to the eye, sources of pride to the communities they honored; they

*See Architectural Record, May 1904.

Entered May 22, 1902, as second-class matter, Post Office at New York, N. Y., Act of Congress, of March 3d, 1879.

FIG. 1. STAFFORD LITTLE AND BLAIR HALLS, PRINCETON UNIVERSITY.
Cope & Stewardson, Architects.
Princeton, N. J.

FIG. 2. NEW DORMITORIES, UNIVERSITY OF PENNSYLVANIA.
Cope & Stewardson, Architects.
Philadelphia, Pa.

FIG. 3. PEMBROKE COLLEGE, BRYN MAWR COLLEGE.
Bryn Mawr, Penn. Cope & Stewardson, Architects.

could not have added in forcefulness to the example already set, to the standard already established. Why? Simply because these were even now declared by the University of Pennsylvania, Princeton and Bryn-Mawr with all possible vigor and conviction. We may refuse to learn the lesson. If so, the reason lies in our stubbornness, not in the inadequacy of the precept. If we now remain unconvinced, a thousand more buildings could not have changed the issue.

Personally, we must grieve forever over the loss of two altogether lovable men; professionally we can say, and without irreverence, "Lord, now lettest Thou Thy servants depart in peace, according to Thy Word; for our eyes have seen Thy salvation."

The things that Eyre, Day, Cope and Stewardson stood for can defy death; those that have laid down their earthly instruments of service leave the world richer on their going and the cause is not weakened thereby.

What are these things? Well, apart from those personal considerations which were so dominant but which are hardly to be spoken of here, they are, it seems to me, three in number, so far as they apply to the art of architecture; and these three things are absolutely and forever indispensable in any honorable practice and achievement: personality, good taste, poetry. There are many other things also necessary, but they are emphasized by other men, and the three qualities named above are often forgotten or overlooked by those who are fighting most strenuously for the other valuable considerations that chance to appeal to them most strongly.

Here lies the greatest artistic value of the principles and labors of the Philadelphia school; their insistence on certain essentials that are apt to be forgotten by the exemplars of the new mode in the art of architecture who were trained in a school that is weakest in these three respects.

While all the Philadelphia firms of the architectural reformation insisted on all three of these qualities, I feel that each in a way stood for one in particular: Mr. Day, as I have already said, for good taste, Mr. Eyre for personality, Cope and Stewardson for poetry. Each denomination includes many things: good taste implies a feeling and a demand for abstract beauty of line, form, color; personality presupposes individualism, genuineness, faithfulness to self and to ideals; poetry includes emotional appeal, historic suggestion, ethnic and racial memories. In this respect the work of Cope and Stewardson is one of the most singular examples of concentrated and conscientious work we have on record; in the quadrangles of the University of Pennsylvania, before the rocky towers of Princeton, the orieled walls of Bryn-Mawr, we are so dominated, controlled by the glamor of poetry, the force of historic and ethnic suggestion, that it is some time before we can recover the critical spirit, weigh and analyze the component parts of the great whole and say whether all is good or whether under the veil of emotional suggestion may not lurk weaknesses and defects.

Consider, for example, Figures 1, 2 and 3—three typical views of Princeton, Bryn-Mawr and the University of Pennsylvania. This is poetry, sheer, unmitigated romance. One thinks of the turbulent affectations of Harvard, a "rogues gallery" of discredited architectural superstitions; of Yale, where new wine is put into old bottles and old wine into new bottles and the uncongenial receptacles jostle cheek by jowl; or of that other, where Rome (or Halicarnassus) strikes hands with Puritan thrift, and then, looking around, one thinks back to Oxford and Cambridge and Winchester, and the subtle obsession of the ivied Old World, the call of inextinguishable race-memory enters in and blots out reason and analysis.

FIG. 4. THE LOGAN OFFICES.
1305-1307 Arch Street, Philadelphia, Pa. Cope & Stewardson, Architects.

Shake off the dream, for it betrays judgment. There is something here that is not there, and it is good; how good I do not dare to say, but there is another side to the shield. Poetry is sometimes the poet's undoing, and, on the other hand, chaos does not always destroy good sense, nor an alliance of Rome and economy —of means and emotion—make impossible the attainment of sound proportions and logical forms.

It is probably impossible for any one man to judge architecture judicially—or any other form of art for that matter. The bent of his mind is in one of two directions: towards logic or poetry; towards organic development, law and order, exact relations, scientific, even mechanical proportions, the subordination of the individual to precedent and dogma defined *ex-cathedra*, or towards romance, emotionalism, personality; the voicing of the eternal ambitions and aspirations and devotions of mankind; service and self-sacrifice, awe, majesty and power, dreams and aspirations; above

all, worship, reverence for the past with all its connotations of heroism and chivalry, of splendid achievements and no less splendid failures. In a word one holds by eternal law, the other by indestructible race fealty and religious continuity.

Yet neither Paganism nor Christianity has been unmingled in the past of the elements that we now predicate exclusively of each. The Greeks reared on the Acropolis an architectural composition almost as full of emotional import and poetic quality as an English abbey or a Venetian palace, and so did the Romans on the hills around the Forum. In France, in the thirteenth century, a style was developed as logical, classical, calm and law-abiding as that of the time of Pericles. The construction of this epoch was absolute science reduced to its ultimate terms, the design—as witness the West front of the Cathedral of Our Lady of Paris—was pure classicism translated into the new language of a new people.

In spite of the sports of ungovernable genius, however, the general proposition holds good that there are two types of mind, one of law and logic, the other of poetry and adventure; hitherto these have existed sequently, now they live side by side, and at the very moment when a powerful tendency towards the former emanates from New York, the latter has developed its greatest exponents in Philadelphia. Some day a man or men may arise who will marry the two in indissoluble union. When this day dawns we shall have "a new style of architecture" and art a new lease of life, but the glimmerings of this dawn are not as yet discernible.

In the work of Cope and Stewardson, then, we find a new manifestation of one of the salient elements in mediæval civilization. I do not mean by this that it is reactionary, artificial, "The Case of M. Waldemar" put into architectural form, for this very element is, or should be, not of mediævalism alone, but of all true Christian civilization of whatever time, of whatever people. In our vanity we had forgotten it, and to that extent our civilization ceased to be Christian. The Philadelphia group has stood and is standing for nationality, for ethnic continuity and for the impulses of Christian civilization.

The unmistakable note is struck in the very beginning. I am not sure, but I think there is manifest internal evidence that Figures 4 and 5 are of almost the earliest work of this firm, when the poignant poetry of Stewardson's nature was first clamoring for expression. The fanciful little offices in Philadelphia are of course "sketch-book architecture" without much scale and with less logic, but they are pure poetry and promised vastly for the future. The cottage in Chestnut Hill is far more serious, for it has in addition to its charm, self-restraint and the indigenous quality. In Figures 6, 7 and 8, we see what came of this—three consummate examples

of consistent domestic building, two of them showing the masterly development of local types, the third the lawful adaptation to American conditions of the ancestral style in England, a patrimony that none can take away. Compare these four examples of good American domestic architecture with the polished French villas now so much in evidence and say whether or no the instinct of the poet is not sometimes a safer guide than the elaborate and specious dicta of an over-trained theorist.

The same thing holds in the more stately form of design that is involved in the city residence. In Figure 9, we see, as must have been the case considering its evident date, the trail of continental journeyings, perhaps also the influence of Mr. Eyre and Mr. Day, but in Figures 10 and 11, we find the fine fruition of the beginnings in calm, convincing, high-bred work that is local in its primary assumptions, logical in its perfect adaptation to contemporary conditions.

It was, of course, in the great group of dormitories for the University of Pennsylvania that Cope and Stewardson first came before the entire country as the great exponents of architectural poetry and of the importance of historical continuity and the con-

FIG. 5. HOUSE AT CHESTNUT HILL.

Philadelphia, Pa. Cope & Stewardson, Architects.

FIG. 6. THE IVY CLUB.
Princeton, N. J. Cope & Stewardson, Architects.

notation of scholasticism. These buildings are among the most remarkable yet built in America, yet they may be and must be criticised. They fail in certain important particulars, and the fact that they succeed supremely in others, while nearly all their defects have been outgrown in later work, justifies such criticism.

First of all, let it be said at once that primarily they are what they should be: scholastic in inspiration and effect, and scholastic of the type that is ours by inheritance; of Oxford and Cambridge, not of Padua or Wittenberg or Paris. They are picturesque also, even dramatic; they are altogether wonderful in mass and in composition. If they are not a constant inspiration to those who dwell within their walls or pass through their "quads" or under their vaulted archways, it is not their fault but that of the men themselves. Thus far all is good and a source of indelible thankfulness. I submit, however, that there are faults, and to me they are these. In the first place, they fail in architectural proportion; not in composition, that is another matter, but in the relationship of parts, the dimensions and disposition of door and window openings, the delimitation of vertical and horizontal spaces, the emphasizing of lines, contours and bounds. One feels this in the triangular court (Figure 12) where the lights of the mullioned windows are much too wide

for their height, where an attempt has been made by disproportionate decoration to raise the many little doors into artificial prominence, where no strong, calm verticals appear to minimize the confusion of multiplied mullions. One feels it in the lack of scale of the oriels in Figure 13, and in the minute and confused parts of the arched gateway. Particularly does it strike one in the Memorial Tower (Figure 14) where the horizontals are without rhythm or sequence, where every vertical is adventitious, not structural, while the whole effect is somewhat unbalanced and top-heavy. It is in a way the difference between thirteenth century Gothic in France and England, between the West front of Notre

FIG. 7. LLOYD HALL, HAVERFORD COLLEGE.

Haverford, Pa. Cope & Stewardson, Architects.

Dame and that of Salisbury; and as they learned better in England later on, so did Cope and Stewardson when they came to work in Princeton and Bryn-Mawr.

A second defect lies in the detail. Here it almost seems as if the architects had been betrayed through the arguments of archæology and consistency. In the style they accepted as their base, that of the reigns of King Edward VI. and Elizabeth, the detail had been degraded and Germanized. This debased detail Cope and Stewardson accepted as a part of the style. It seems to me that here was a case where consistency was not a jewel, but paste. If a thing is not intrinsically beautiful it is valueless, no matter how consistent it may be. Classical principles of architecture were pro-

found and sublime; the detail with which they were overwhelmed in the sixteenth and seventeenth centuries was exceedingly vicious. If in accepting the underlying principles we swallow the bitter pill of vulgarized detail, we become copyists, not architects. There is only one consistency in architecture, and that is faithfulness to sound principles of structural development and to the production of absolute beauty. Cope and Stewardson did everything men could do to redeem Elizabethan detail, but they could not quite succeed in making a silk purse out of a sow's ear.

The tower has been severely criticised as an archæological abstraction reared to commemorate contemporary American heroism. The criticism seems just to me, though only in a measure. Amer-

FIG. 8. COLONIAL RESIDENCE.
Princeton, N. J. Cope & Stewardson, Architects.

ican heroism harks back to English heroism; the blood shed before Manila and on San Juan Hill was the same blood that flowed at Bosworth Field, Flodden and the Boyne. Therefore the British base of the design is indispensable, for such were the racial foundations. On the other hand, this tower was of the nineteenth century and the men it commemorated were American; it seems plausible therefore to plead that something of this time and place should be expressed. How this might have been done will be shown some day by what will be done, but now the question is involved and tenebrous and no adequate answer is forthcoming. One thing we may say, however, and that is that the decoration might have been significant; the grotesques might have been descriptive, not historic; the empty shields increased in size and number and charged

with national heraldry, while the whole tower, primarily commemorative, not utilitarian, might have been given a military suggesiveness instead of the domestic quality now imposed by the apartment house fenestration.

Lest this may all seem severe and unfriendly criticism, let me say once more that in spite of the defects which have seemed to me worth noting, the whole work is masterly in conception, true in impulse and far less subject to detailed condemnation than the vast majority of work. It is so nearly right in every way that it will bear criticism when less significant work would sink under it.

FIG. 9.—DR. HARTE'S RESIDENCE, 1503 SPRUCE ST.
Philadelphia, Pa. Cope & Stewardson, Archts.

Moreover, as I have already said, Cope and Stewardson never made the same mistake twice, and the lessons learned here bore fruit in Princeton and Bryn-Mawr. The latter work is peculiarly interesting, for it shows how steadily the firm continued its development. The early portion shows a distinct and considerable advance beyond the University of Pennsylvania dormitories, better in scale, in proportion; more self-restrained. Rockefeller Hall, now in process of construction, is better still in each regard. Yet the whole lacks nothing in beauty and picturesqueness and poetry. To be sure the material is better, that very wonderful flat-bedded stone that is such a striking evidence of the goodness of Providence in furnishing architects with miraculous means to good ends, but even this mercy may be used to a man's destruction, and the fine quality of the work itself has more to do with the result than the building stone so splendidly used.

It is in Princeton, however, that the climax is reached, at all events so far as the scholastic work is concerned. The Gymnasium seems to me half-hearted and perfunctory, an attempt to clothe a modern proposition in "Monk Latin" as it were; not to be compared for a moment with Messrs. Frank Miles Day and Brother's logical and consummate treatment of the same problem, but Blair and Stafford Little Halls are exactly the reverse of this in every

FIG. 10. 1631-1633 LOCUST STREET.

Philadelphia, Pa. Cope & Stewardson, Architects.

FIG. 11. RESIDENCE IN PHILADELPHIA.

Cope & Stewardson, Architects.

FIG. 12. TRIANGLE, DORMITORIES—UNIVERSITY OF PENNSYLVANIA.
Philadelphia, Pa. Cope & Stewardson, Architects.

FIG. 13. DORMITORY BUILDING—UNIVERSITY OF PENNSYLVANIA.
Philadelphia, Pa. Cope & Stewardson, Architects.

FIG. 14. MEMORIAL TOWER.
Dormitories, University of Pennsylvania.
Philadelphia, Pa. Cope & Stewardson, Architects.

respect. If there is anything more poetic, collegiate, racial and logical than the composition of these two buildings in Figure 1, so far at least as the product of the last four centuries is concerned, I do not know what it is. The thing is neither monastic nor mediæval, it is without affectation or theatrical quality. It strikes exactly the right note, it is sufficiently British, sufficiently American, a perfect model of sound design and impeccable theories. Figure 16 is in itself a testimony to the substantial accuracy of the strictures I have ventured to make on the University of Pennsylvania dormitories, for it shows every one of the faults altogether eliminated.

I said above that Cope and Stewardson never made the same mistake twice: I am afraid this is not strictly true in the case of Washington University, St. Louis. There seems here an unmistakable sign of unexpected reaction, if, as I assume is the case, the designs are later in date than those for Princeton. The general scheme is blocked out with a masterly hand, but such of the individual buildings as have been erected seems to me curiously lacking in personality, while the sense of proportion and composition falls far short of that shown in Princeton and Bryn-Mawr. Moreover, there is a recurrence of the Elizabethan detail so much in evidence in the Philadelphia dormitories, with the same disregard of absolute beauty in decoration. I cannot feel that University Hall is notably interesting, either in design or detail, while there is a lack of scale and harmony between the ornament of the tower and its mass and materials (Figure 18). That the Schools of Architecture and Engineering (Figure 17) are not thoroughly good solutions of the contemporary architectural problem, I feel very strongly, and this in spite of certain refinements in composition that are the mark of good style. That the ornament of a building such as this should consist in more than the stock properties of impossible festoons of fruit, cupids' heads and cartouches (Figure 19), I also feel strongly. When a Greek drama has been translated into Latin, from this

FIG. 15. ENTRANCE TOWER, PEMBROKE HALL, BRYN MAWR COLLEGE.

Cope & Stewardson, Archts.

FIG. 16. STAFFORD LITTLE HALL.
Princeton University.
Princeton, N. J. Cope & Stewardson, Architects.

language into Italian, thence into Low Dutch, and so into English, there is not apt to be much of the original left, and it is hardly a good model to use as a basis for creative work.

Thus far all the work we have considered has been of one general type, either some adaptation of some form of English collegiate or, in the case of domestic work, of early American types. The Law School of the University of Pennsylvania (Figure 20) is a kind of connecting link, a most able and interesting example of a venture into a late Stuart field, the true "Queen Anne." The style is handled with fine independence and energy, a new and vital spirit has been breathed into the dry bones and they live again, not as a phantasm but as a new organism. Here the detail, founded on a better prototype, is plausible, adequate and if not perhaps intrinsically beautiful, well placed, in good scale and entirely decorative.

FIG. 17. SCHOOL OF ARCHITECTURE.
(Washington University.)
St. Louis, Mo. Cope & Stewardson, Architects.

FIG. 18. TOWER OF UNIVERSITY HALL.
(Washington University.)

St. Louis, Mo. Cope & Stewardson, Architects.

FIG. 19. DOORWAY OF BUSCH HALL.
(Washington University.)
St. Louis, Mo. Cope & Stewardson, Architects.

The interior (Figure 21) is also very delightful in its clever use of late seventeenth century English models.

The Leamy Home, Mt. Airy, Pennsylvania (Figure 23), is a good example of the amazingly competent manner in which these architects use our own early models as a basis for contemporary work, the same so-called "Colonial" they have made so living in domestic work. Handled by the average architect of the progressive and thriving suburbs, "Colonial" is a very terrible thing indeed, and it needs sometimes that really great men should deal with it in order to remind us of the homely but sterling virtues it once possessed. As Cope and Stewardson work in it, it is a thorough joy. Frank, direct, straightforward, the exterior developing accurately from the interior, and that exclusively from certain definite needs; delicate in its detail, simple in its masses, it is a constant incentive to self-restraint—not the last of the basic principles of architectural design.

We now find ourselves confronting a building with which it is somewhat hard to deal, the "Institution for the Instruction of the Blind," in Overbrook, Pennsylvania (figures 28, 29). Let us admit at once that in the abstract it is altogether wonderful, and definitely charming. If one were to find it in South America, or Mexico, or Southern California or Florida, one would accept it at once as local, triumphant, convincing. But is it as one actually discovers it, in a most respectable suburb of the *ci-devant* Quaker town of Philadelphia? It is of the South in plan, conception, material, color, detail. As the National Pavilion of the Republic of Mexico in a World's Fair, it would be a triumph, but is it a serious contribution to the development of a national architectural style in North America? In and by itself it is a masterly mingling of Central Italian and Latin American suggestions, consistent, harmonious and vastly edifying; but—is it a blind asylum in an old Northern State, founded and settled by sturdy English Quakers? Of course, if there is no such thing—for ourselves—as a real architectural language, if we are to abandon the effort to develop this, contenting ourselves either with personal and individual expression or the housing of a score of different interests each in its own historically suggestive shell, then this sort of thing is all right. But are we? Can we give up our hope quite yet? Can we not throw our little weight on the side of the centrifugal, not the centripetal forces? If we do something may come of it in the end, and we all may get nearer together, concentrating and uniting at least in one more manifestation of national racial art.

Of the latest product of the firm of Cope and Stewardson, the successful design for the Municipal Building for the District of Columbia, it may be said that it shows, as does the last work considered, how easily this remarkable firm adapts itself to new ways, new conditions. It is an essay in the very latest architectural fashion now current, the classic of the Ecole des Beaux Arts tinged by the dominating genius of another remarkable firm, that of Carrére and Hastings. The design contains nothing of the intense personality manifested in so nearly all the other work the former have produced; it shows nothing of the intimate genius of John Stewardson or Walter Cope. It is simply an honest, straightforward rendering of a modern problem, couched in a pre-arranged style. It is all handled seriously and with thorough ability, but it is an abstraction, not a personal manifestation. If this is a defect, and as matters now stand none can say this with any sure conviction, it is not to be attributed to the firm in any respect, for a "personal manifestation" would probably have stood not the ghost of a show of consideration with any jury that might have been chosen to pass upon this particular competition. Cope and Stewardson

FIG. 20. LAW SCHOOL.
(University of Pennsylvania.)
Philadelphia, Pa.
Cope & Stewardson, Architects.

FIG. 21. INTERIOR OF LAW SCHOOL.
(University of Pennsylvania.)
Cope & Stewardson, Architects.
Philadelphia, Pa.

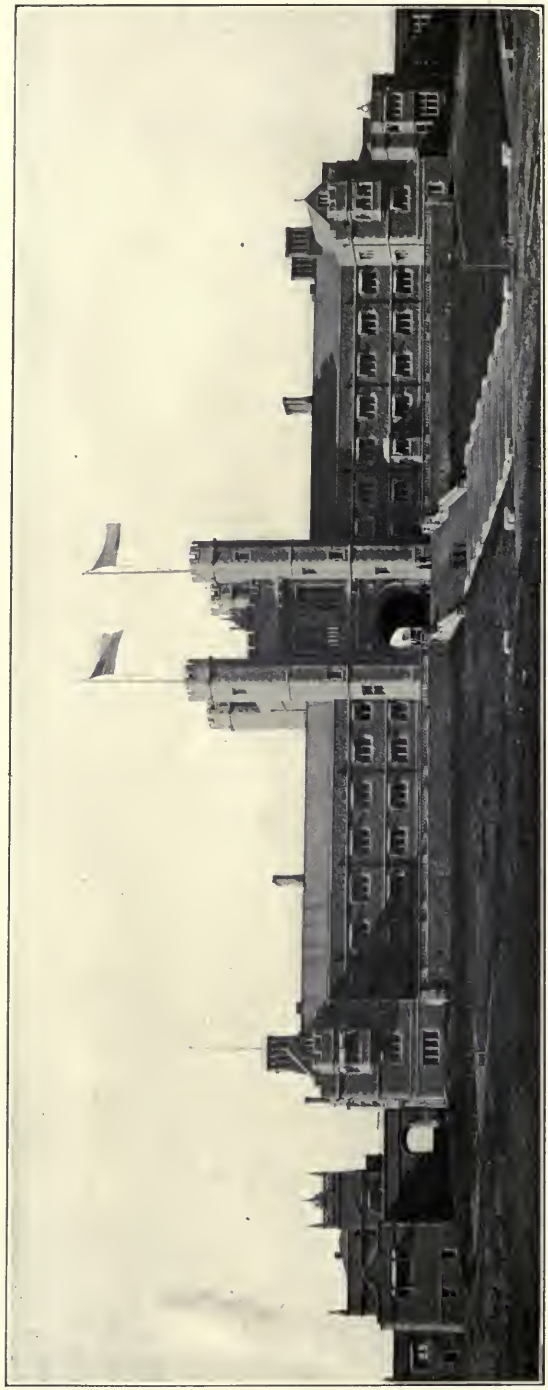
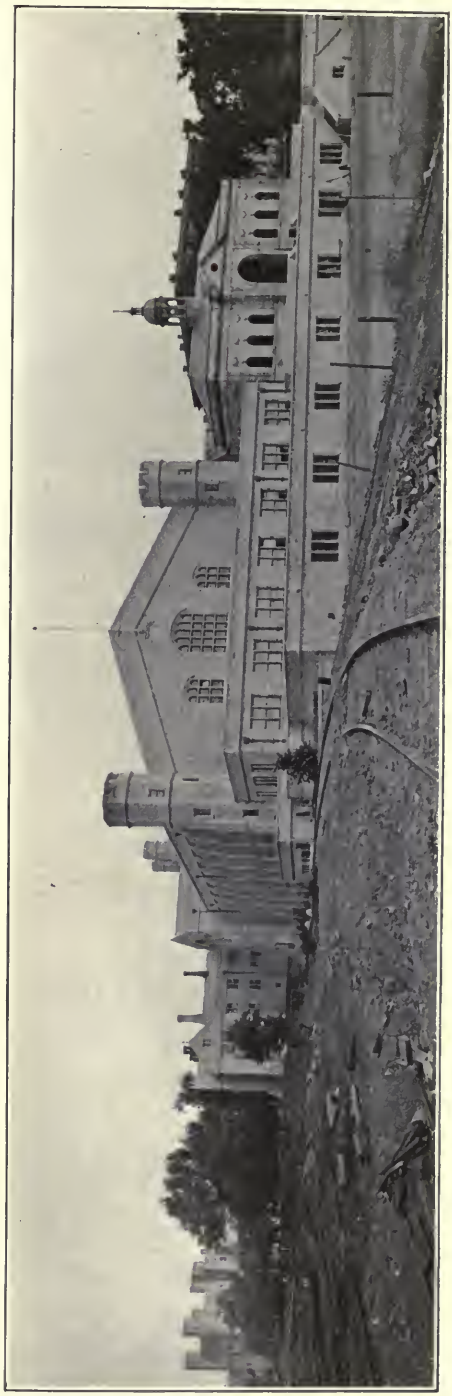


FIG. 22. UNIVERSITY HALL.
(Washington University.)

St. Louis, Mo. Cope & Stewardson, Architects.



THE GYMNASIUM, PRINCETON UNIVERSITY.

Cope & Stewardson, Architects.

Princeton, N. J.

FIG. 24. MAIN ENTRANCE TO PENNSYLVANIA INSTITUTION FOR THE INSTRUCTION OF THE BLIND, OVERBROOK, PA.

Near Philadelphia, Pa. Cope & Stewardson, Architects.

FIG. 25. PENNSYLVANIA INSTITUTION FOR THE INSTRUCTION OF THE BLIND, OVERBROOK, PA.

Near Philadelphia, Pa. Cope & Stewardson, Architects.

FIG. 26. CHOIR SCREEN, ST. LUKE'S CHURCH.

Germantown, Pa. Cope & Stewardson, Architects.

FIG. 23. LEAMY HOME.

Mt. Airy, Philadelphia, Pa. Cope & Stewardson, Architects.

simply bowed to the inevitable, and made the best of it, and this best was notably good.

In what I have already written about the work of Frank Miles Day and Brother, I have dealt at some length with the Archæological Museum in Philadelphia, that wonderful building where there was certainly enough of "personal expression," and where four brilliant men met on common ground for the production of a masterpiece. What Mr. Cope's share was in the work, or Mr. Stewardson's, no one will ever know, but a measure of the honor goes to them as well as to Mr. Eyre and Mr. Day, for all were equal.

I have spoken of hardly a tenth of the work of this firm, and yet I have left myself little space to consider one very important category in which, indeed, they have as yet unfortunately done little,

FIG. 27. THE LIBRARY—BRYN MAWR COLLEGE.

Bryn Mawr, Pa. Cope & Stewardson, Architects.

FIG. 29. INTERIOR ST. MARK'S CHAPEL.

Philadelphia, Pa. Cope & Stewardson, Architects.

FIG. 30. ENTRANCE TO THE ENGINEERING BUILDING.
(University of Pennsylvania.)
Philadelphia, Pa. Cope & Stewardson, Architects.

but that little is exceptionally good. I refer to Ecclesiastical design, a place where their peculiar genius was keenly demanded. None could do better work than they, but the demand for this quality of service is not very insistent just now, standards having become so confused that the tenth rate is frequently considered quite good enough. The design for the Chapel for Washington University hardly seems to me either organic or convincing, but it is never fair to judge a work from a drawing alone. On the other hand, the Choir Screen in Germantown (Figure 26) and the little Chapel for St. Mark's Church, Philadelphia (Figure 29) leave very little to be desired. The former is a perfect delight and shines like the sun in what are evidently very awful surroundings. There is the touch of consummate art in every line. The Chapel is more reserved and severe, but it is just as satisfying and makes one regret very bitterly that no great church now stands bearing the name of Cope and Stewardson.

Ralph Adams Cram.

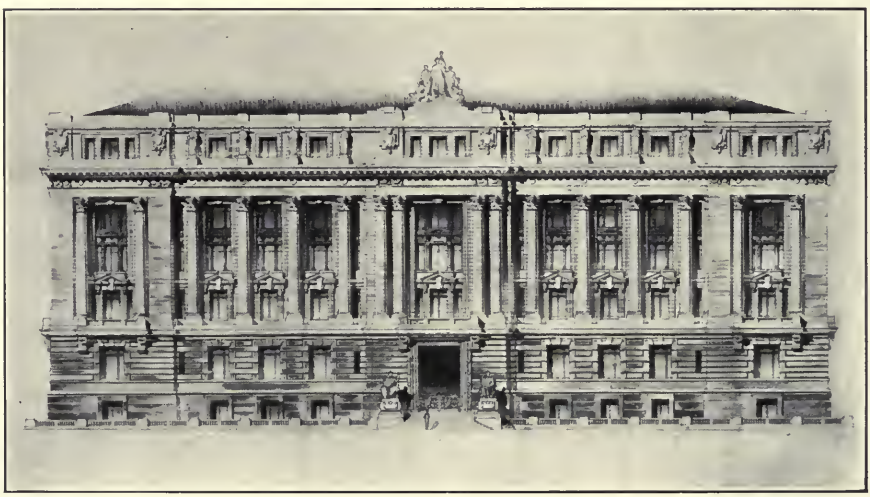


FIG. 28. THE MUNICIPAL BUILDING FOR THE DISTRICT OF COLUMBIA.
Washington, D. C. Cope & Stewardson, Architects.

ARCHITECTURAL REFINEMENTS IN FRENCH CATHEDRALS.

Second Paper.*

The Cathedrals of Paris and Amiens.

A GLANCE at the illustrations of my August paper, as connected with the dimensions of the original buildings which are mentioned in the text, will show that these illustrations were selected, with one exception, from churches of small dimensions, and in several instances from side aisles of these churches, which are of smaller dimensions than the naves. The apse of the Balaban Aga Mesjid (Fig. 1 of the August Number) is only 12 ft. in height. The height of the piers in St. Mary Diaconissa, at Constantinople, is 33 ft. In St. Jean at Caen this height is 35 1-2 ft. In St. Loup at Chalons it is 32 ft. In the side aisles of St. Alpin and Notre-Dame at Chalons, the heights of the pilasters illustrated were respectively 14 ft. and 15 ft.

The Widening in Notre-Dame.

These remarks bear on the possibly inadequate impression which the photographs of the outward divergence in Notre-Dame at Paris and in Amiens Cathedral (Figs. 1 and 4) may make upon the reader, as compared with the pictures of churches of smaller size, in the preceding paper. It must be borne in mind that in cuts of these small dimensions we are now representing naves which are 147 ft. in height at Amiens and 110 ft. in height at Paris. Consequently the divergence of the piers at Amiens, which is nearly 3 ft., is not very clearly seen in Fig. 4.

The divergence at Paris in the piers at the crossing of nave and transept is more easily seen in Fig. 1, although it is of less amount (about 21 inches in the piers on the choir side of the transept), because the church is not as high as at Amiens and the picture is consequently of larger size, as compared with the original. For one who is familiar with the large photographs of Notre-Dame in the Brooklyn Museum, Fig. 1 is, however, somewhat disappointing, as compared with the enlargement from the same negative.

In this exhibit of photographs of French cathedrals, which was installed early in June, there are twenty-eight photographs of Notre-Dame which are 25x35 inches (inside photograph measure)

*In continuation of the paper which appeared in the August Number, on "Architectural Refinements in early Byzantine Churches and French Cathedrals." The illustrations of these papers are from photographs of the Brooklyn Museum surveys, of the series of 1903. The purpose and effects of the refinements described in these papers have been discussed at considerable length in previous publications, relating to other churches. See, for instance, Brooklyn Museum Memoir No. 2, "The Architectural Refinements of St. Mark's at Venice," published by the Macmillan Company.

FIG. 1. THE NAVE OF NOTRE-DAME.

Note plumb-line suspended from triforium on the right, beside the pier at the crossing. The chandelier chain does not offer a plumb-line, because it is tied out of perpendicular.

and seventeen photographs which are 18x22 inches. Five photographs of size 25x35 inches and three photographs of size 18x22 inches are devoted to the vertical curves and the widening of the nave in Notre-Dame. For readers in the neighborhood of New York an inspection of these photographs may be recommended. The difference in size between Fig. 1 of this paper and the corresponding large photograph, No. 65, of the Brooklyn exhibit, from the same negative, makes a surprising difference in the appearance of the divergence of the piers at the transept.

In the size of the last-named photograph it even appears more striking than it does in the church itself, where the convergence due to perspective tends to diminish its effect.

In spite of the somewhat inconspicuous character of the divergence, as seen in Fig. 1, it may be asserted with great confidence that no reader of this paper who examines the Brooklyn exhibit (or who examines the building itself) will find it to be inconspicuous or unimportant. Meantime, let a slip of paper be laid across Fig. 1, over the piers at the transept next the choir and marked with a pencil, so that the width of the pavement between these piers may be compared with the width at the capitals.

As a matter of fact, and speaking of observation on the spot, there is no church so far examined in northern France, aside from that of St. Quentin, in which the nave widening is so conspicuous as it is in the farther pair of piers at the crossing in Notre-Dame. As regards the general oversight of this fairly conspicuous fact in Notre-Dame, it may be due to the effect of perspective convergence which tends to make the diverging vertical lines appear parallel. Psychologists have taught us that there is a habit of "expectancy" in the eye which leads us to see what we expect to see, or are in the habit of seeing, under the given circumstances. This is probably another reason why this feature in Notre-Dame is so generally overlooked.*

Aside from the church of St. Quentin and from other churches illustrated in the August Number, and from Notre-Dame, the most conspicuous cases of widening so far observed in France are in St. Pierre at Caen, in the church of the Monastery of Montierneuf at Poitiers, and in the Cathedral of Amiens. Less conspicuous, but well-defined instances are the cathedrals of Rouen, Laon, Rheims, Chalons, Beauvais, Strassburg, and the church of St. Remi at Rheims. In all of these cases the vertical lines also bend or curve. The best French instance of a nave showing uniformly employed and strongly defined vertical curves without widening, is the Cathe-

*This habit of "expectancy" has another result, after one has begun to look for vertical curves and for the widening construction. It then leads one sometimes to see these phenomena where they do not exist. This, at least, is my own experience, so that I have grown to trust nothing but a plumb-line or a carefully made photograph, in the less conspicuous cases.

dral of Noyon, as far as recent observations have gone. The facts are well represented for all these buildings by the Brooklyn exhibit.

For a complete record of all the observations of 1903 in France Museum Memoir No. 4 (Macmillan) may be consulted. This includes mention of the churches and cathedrals which were examined and in which the phenomena described have not been observed. Among these are the cathedrals of Bayeux, Soissons, Poitiers, Chartres, Tours, the churches of St. Ouen and St. Maclou at Rouen, of L'Épine near Chalons, and the Sainte Chapelle at Paris.

Vertical Curves in Notre-Dame.

To return to Notre-Dame at Paris, no time should be lost in mentioning that the marked divergence in the second pair of piers at the crossing (side of the choir) is not to be found to the same extent in the first pair (side of the nave) or in the vaulting-shafts of the nave, in which last, however, the vertical curves are much more prominent than they are in the great leaning piers at the transept.

As for the vaulting-shafts of the choir they have pronounced curves, but they converge instead of diverging vertically. The amount of this narrowing in, for any one pair of vaulting-shafts, has been estimated with approximate accuracy as from 6½ to 7 inches. Thus each vaulting-shaft leans toward the centre of the choir from 3 to 3½ inches, in its upward curve. The vaulting-shafts which bound the walls of the choir before it turns to the curve of the apse neither converge nor diverge. They are perpendicular.

As regards the body of the church we record first the marked difference of inclination as between the two pairs of piers at the crossing. Those next the nave diverge about 12 inches, as contrasted with a divergence of 21 inches for the pair next the choir. The vaulting-shafts of the nave curve much more perceptibly, but have the same amount of divergence, approximately, as the first pair of piers at the crossing, in amounts varying from 7 inches to 12 inches. The amounts of divergence are estimated individually as follows, for the first five pairs of vaulting-shafts, in order from the transepts toward the main entrance—10 inches, 10 inches, 7 inches, 9 inches, 12 inches. The last measurement will hold very closely for the 6th and 7th pairs of vaulting-shafts (in order from the transepts).

The foregoing estimates of measurement are confined to the vaulting-shafts and do not include the round piers which support them, because the alignments do not correspond. The piers lean slightly into the nave, thus increasing the effect of the bend above. For instance, the fourth pier from the entrance on the right was

FIG. 2. NOTRE-DAME, PARIS. PIER AND VAULTING-SHAFT LOOKING UP THE PIER.

found, by plumb, to lean into the nave 0.23. (The piers at Amiens also bend into the nave.)

We come next to the great piers of the tower construction, fronting the organ gallery, which are perpendicular as regards the north and south direction, and without curvature.

These piers and all the piers and all the vaulting-shafts of the nave lean laterally west toward the entrance in amounts ranging from six inches upward and increasing in amount toward the entrance, a disposition which contributes to a greater appearance of widening than actually exists, when viewed from the west, but a separate article will be needed to explain these arrangements. They are mentioned now in passing.

As regards variations from the true perpendicular in the north and south direction, they may now be rehearsed, as follows, moving in the direction from entrance to choir.

Piers at the organ gallery—perpendicular. Seven pairs of vaulting-shafts in the nave—strong vertical curves, with divergence ranging from 12 to 7 inches (the individual shafts thus bending outward, and away from the nave, from 6 to 3½ inches each). Piers at the crossing (side of the nave), widening of 12 inches. Piers at the crossing (side of the choir), widening of 21 inches. Vaulting-shafts of the choir—strong vertical curves leaning into the choir, with convergence from 6½ to 7 inches, or individual inward bends of from 3 to 3½ inches. Vaulting-shafts terminating the side walls of the choir—perpendicular.

Fig. 2 shows a vertical curve in the nave of Notre-Dame, as seen when looking up the pier. This photograph shows the second vaulting-shaft on the left of the nave, beyond the great piers next the organ gallery.

As far as my information goes, the widening in Notre-Dame has attracted attention only in consequence of the publications which have been made in the Architectural Record and in the Brooklyn Museum Memoirs, regarding similar phenomena in Italy. Mr. Nelson Goodyear observed it soon after he had assisted in the survey of Sta. Maria della Pieve, in 1895. It was subsequently brought to my notice by the careful observations of Professor John F. Weir and Professor Charles S. Hastings, of Yale University.

Leans of the Transept Vaulting-Shafts.

A most remarkable arrangement in the transepts and transept galleries of Notre-Dame is that the vaulting-shafts of the transepts lean off laterally right and left, so that they continue and repeat the leans of the great piers at the transept. The significance of this observation will appear to every expert who notes that these in-

FIG. 3. NOTRE-DAME, PARIS. LEFT TRANSEPT GALLERY, LOOKING TOWARDS THE CHOIR.

clinations are constructed laterally in the solid wall. The columns of the triforium arches are also set parallel with these leans.

If close attention be given to Fig. 3 it will be found to illustrate these arrangements. This cut represents one of seven 5x7 photographs which were devoted to this special class of facts in Notre-Dame, of which four have been enlarged and are now exhibited in Brooklyn.

Fig. 3 is taken from a point of view in the left (north) nave gallery, looking across the left transept to the choir. On the extreme right of the picture is seen the lean of the great pier at the crossing of the left transept and choir. (This is the second of the great piers seen on the left in Fig. 1). In the foreground, on the right, Fig. 3, is a leaning column from which two plumb-lines are suspended. Next to it, in the foreground, is a pier which, on its outer exterior side (fronting on the transept), is a portion of the vaulting-shaft which rises from the pier to the vaulting above. On the side of this pier facing the reader is another plumb-line. On the left, in the foreground, one of the leaning columns of the next adjacent bay is seen and from this another plumb-line is suspended.

These four plumb-lines in the foreground enable the reader to observe the leans of the vaulting-shafts on the farther side of the transept. These vaulting-shafts are imbedded in the wall of the transept and their inclinations are constructed laterally in the wall, so that every suspicion of accidental masonry movement is eliminated. Thus, note first on the left of the picture, the vaulting-shaft on the opposite transept wall, as compared with the perpendicular which is established by the plumb-lines in the foreground.

Note next, the pier in the centre foreground, and then the rib of the vaulting-shaft across the transept, which is visible beyond the right side of this centre foreground pier. The rib leans parallel with the foreground pier. Other photographs show the entire shaft of which this rib is a portion.

Similar facts will appear for the vaulting-shafts of the near side of the left transept, if viewed from the choir. Similar facts appear on both sides of the right transept, as attested by photographs in Brooklyn.

From pavement to vaulting, the leans of these vaulting-shafts, on the choir side of the transepts, amount to about one foot. As measured for the heights directly accessible in the galleries, with a line of 10½ ft., the following results are obtained for the left transept gallery, part of which is seen in Fig. 3:

All leans to the left—pier next the transept end walls 0.15; column 0.12; column* 0.13; pier* (both sides) 0.14, 0.14; column* 0.24; column 0.20; pier next the nave 0.10.

*The stars mark the columns and piers on which the plumb-lines are seen in Fig. 3, in order from left to right.

Plumb-measurements of the same average amount, all uniform in direction, that is, all leaning north in the north transept galleries and all leaning south in the south transept galleries, have been published in Museum Memoir No. 4 for the other transept galleries and are verified by the exhibited photographs.

It is a general rule that the columns lean more than the piers of the same height which belong to the system of the vaulting-shafts. The reason is obvious, that in the case of the latter a small fraction of a uniform lean which runs from pavement to vaulting, is in question, whereas the columns are not portions of this continuous system and could consequently be given a somewhat more defined inclination.

Notre-Dame at Paris does not stand alone in this remarkable feature of the parallel transept leans. Similar arrangements are found in the transepts at Amiens, as subsequently mentioned and illustrated.

Similar facts are found in the transepts of the Church of St. Quentin and four enlargements of them are exhibited in Brooklyn.

Before taking up the Amiens Cathedral a few words may be given to the explanation of these inclinations of the transept triforium columns and transept vaulting-shafts, as described for Notre-Dame. They are probably intended to avoid a contrast between adjacent perpendicular and inclined lines. This amounts to saying that the effort was to evade a conspicuous prominence of the primary leans of the great piers, which would be more easily noted, if perpendiculars were found immediately adjacent to them. It seems unnecessary to dwell on the fact that they emphasize the constructive existence and predetermined artistic purpose of the primary leans of the great piers.

The Cathedral of Notre-Dame has other, and still more remarkable, constructive refinements, to which a following paper will be devoted. For the moment, our attention is now turned to the Cathedral of Amiens.

The Cathedral of Amiens.

It is difficult to realize in looking at a cut of the dimensions of Fig. 4 that the widening of the nave at Amiens is very nearly 3 ft. and that in the building itself the vertical curves are of a clearly visible character.

This instance of the inadequacy of a small cut for illustration of well-defined deflections of considerable amount in cathedrals of lofty dimensions leads me to again emphasize the importance of large photographs for these cases. The Brooklyn Museum exhibit for Amiens includes four large photographs of the nave (all 25x35

FIG. 4. CATHEDRAL OF AMIENS. RIGHT SIDE OF THE NAVE.

inches), one of which is taken from the pavement, while others are taken from the organ loft and from the choir triforium. In all of these pictures the curves and the widening are shown clearly.

It has been mentioned in the August Number that the widening, as found in St. Loup at Chalons, is known to the architect in charge and that it has been recognized by him as constructive. It was mentioned in the same article that the widening at St. Quentin was known to the recently deceased architect in charge as constructive. The widening at Amiens is also familiar to the cathedral authorities and to other residents of the town, and there is moreover an explanation given regarding it.

The matter came to my knowledge in the following way. Having presented my photographing permit from the Ministry of Cults at Paris to the cathedral authorities on Sept. 14th, 1903, I was accorded all possible facilities for the prosecution of my work. I did not, however, at this time advise them of its nature or purpose. During the inspection of the cathedral I observed, in the setting of the piers of the transepts, a system of inclinations resembling that which has just been described as existing in the transepts of Notre-Dame at Paris.

This involved the photographing of all these leaning piers and the hanging of plumb-lines beside them from the triforium galleries (see Fig. 6). The placing in proper position of these plumb-lines was naturally a matter of some considerable trouble and personal activity, which was calculated to attract attention. Moreover as the lines hung down from the triforium gallery, revealing the marked inclinations of the piers, beside which they were placed (maximum cases about 5 inches for a height of 40 ft.), they were calculated to arouse the curiosity and interest of passing spectators.

It was under these circumstances that I was accosted by the *Bédeau*,* M. Régnaut, whom I found to be a gentleman of great intelligence. He was much interested in the leans of the transept piers, which were previously unknown to him, but when I mentioned the widening of the nave it appeared that he was thoroughly conversant with it. This was my first advice that the nave widening at Amiens was known to the cathedral authorities.

Further conversation with the *Bédeau* and with the *Suisse* developed the fact that the peculiar construction of the nave had been known for over forty years, at least. There is nothing to show at present that the knowledge concerning it has ever been lost in this locality.

The current explanation of the construction is that it is intended to throw the thrust of the vaulting directly against the flying-but-

*The office of *Bedeau* at Amiens is not at all to be confounded with that of the English church Beadle. It appears to combine clerical and lay duties about the cathedral of considerable importance.

tresses; thus avoiding a movement of the masonry by anticipating its natural action, and by making the strain direct instead of indirect. This explanation is insufficient to cover the facts for the transepts and so appeared to M. Régnaut.

I shall presently mention characteristics of the phenomena in other localities which would also make this explanation appear to be an insufficient one. It is, however, an interesting fact that whereas some experts in the United States have been disposed to attribute all instances of the widening to movements of the masonry, the church authorities of Amiens have been persuaded that the widening was intended to prevent such movements.

It may be added here that the divergence of the piers at Amiens is even mentioned in Baedeker's "Northern France," although it is incorrectly described. Baedeker says . . . "The vaulting is borne by 126 remarkably bold columns, tapering toward the top, so that the vaulting seems actually wider than the pavement below." An inspection of the Brooklyn Museum photographs of the Amiens nave, taken from the organ-loft, will show that the columns of the nave do not taper. They curve vertically outward and away from the nave, without diminishing in size. It is also misleading to say that the vaulting seems wider than the pavement. It is actually wider.

The amount of the nave divergence is estimated by the cathedral authorities as being one metre. This estimate tallies very closely with my own observations. By sighting on a plumb-line which was dropped through an opening in the vaulting near the piers at the transept, one of these was found to bend into the nave about 0.20 and then to curve outward about 1.40. The total divergence would thus be about 2.80. As distinct from the varied arrangements in Notre-Dame and at St. Quentin, those at Amiens appear to be uniform and parallel through the choir and nave with the exception that the great piers at the entrance next the organ-gallery do not diverge and that those next them diverge less than the rest.

The Triforium at Amiens.

Fig. 5 represents one of four similar pictures which were taken inside different portions of the triforium at Amiens, all of which are represented by large photographs in the Brooklyn exhibit. This triforium gallery runs entirely around the cathedral, with a uniform width of about 3 ft.

In looking at Fig. 4 of the nave, it will be observed that if the piers diverge outward at the height of the triforium, it ought to be possible to photograph these divergences from the rear, inside the triforium. This is what has been done in Fig. 5. Two plumb-lines

FIG. 5. CATHEDRAL, AMIENS. CHOIR TRIFORIUM, NORTH SIDE.

are seen in the picture, but rather dimly. The reader will obtain the best indication of the purpose of this view by comparing the outer left boundary line of the picture, which furnishes a true perpendicular, with the adjacent pier, which leans to the right, and away from the choir. The facts are uniform in all parts of the triforium, and the amount of inclination is uniform, on both sides of the choir, and on both sides of the nave. Photographs were made on both sides of the choir triforium and on one side of the nave triforium. These photographs would be sufficient to establish the constructive facts at Amiens, even if they were not verified by local observers.

Fig. 6 represents one of a series of ten enlargements in the Brooklyn exhibit which show the Amiens transepts. Eight of these pictures are 25x35 inches.* The description of the arrangements of the transept piers at Amiens will be assisted by reference to a plan of the cathedral. Unless reference is had to such a plan it should be remembered that, beside the continuation of the single aisles of the nave into the choir and ambulatory, the choir has two additional aisles, making three in all, for the choir and for the corresponding divisions of the transepts. (The outer one of these additional choir aisles is so short as to come under the designation of a chapel, if preferred.) Thus each transept has two pairs of piers, beside the piers bordering on the nave.

Of these piers, all four bordering on the nave lean into it to the height of the capitals, each about 0.40 in 40 ft. (The outward bends for the nave widening begin higher up. These bends are clearly shown in the Brooklyn photographs). All four piers next adjacent lean in the opposed outward direction, about 0.30 on their inner sides. This gives a widening at the openings from the transepts into the aisles of the choir and nave of about 0.70 in 40 ft. The outer sides of these same piers, bordering on the second choir aisles, are closely perpendicular. (See the left pier in Fig. 6.) These piers are consequently tapered about 0.30.

The four exterior piers (next the transept walls) all lean outward on the inner side, about 0.40. (See the right pier in Fig. 6.) They appear to be tapered slightly on the outer sides, but the leans continue on this side.

The facts, as above stated, are attested by the Brooklyn photographs, with plumb-lines for each individual pier, as far as the leans are concerned, and the measurements, for the leans as above given, were obtained in each individual case by careful sighting on the plumb-lines. As regards the perpendiculars and the tapering, the facts are believed to be as stated and have been carefully tested

*In the summer of 1903 fifty-five negatives were made in Amiens Cathedral and eighty-four negatives were made in Notre-Dame at Paris. Nearly all of these are available for enlargement and very few of them duplicate the same facts. The Brooklyn exhibit includes twenty enlargements for Amiens and forty-five enlargements for Notre-Dame.

FIG. 6. CATHEDRAL OF AMIENS. FROM THE SECOND LEFT AISLE OF THE CHOIR, LOOKING WEST. VIEW OF THE LEANING MULLION.

in various ways, although there are two instances in which Renaissance monuments placed against the piers, interfered with dropping the plumb-lines for more than half their height.

Aisles or aisle openings widening on both sides of one aisle have been, so far, only observed at Amiens and at St. Quentien. Generally the aisles widen, if at all, only on the exterior sides, as in St. Alpin at Chalons (Fig. 7, August Number). Fig. 12, of the August Number, illustrates the aisle widening at St. Quentin and will show more clearly than verbal description what the arrangement is at Amiens, unless the Brooklyn photographs are consulted. At St. Quentin the vaulting-shaft on the exterior sides of the aisles curve laterally toward the perpendicular in the solid transept walls above the widening, as attested by four photographs, Nos. 37-40 inclusive, in the Brooklyn exhibit, so that there is no doubt about questions of construction.

As regards the outer transept piers at Amiens a conclusive proof of constructive intention is found in the parallel leans of the vaulting-shafts which are connected with the transept walls and partially attached to them. (Note the shaft in Fig. 6, on the right of the sculptured shrine.) These may be observed for both transepts in Nos. 58 and 62 of the Brooklyn exhibit, and are best seen in these large pictures.

The most astonishing feature of these arrangements is the constructive parallel leaning of the window mullion which is shown by Fig. 6 (No. 62 in Brooklyn). There are four churches known at present in which windows are built to make alignments parallel with leaning piers. St. Loup at Chalons is illustrated for this point in the August Number (Fig. 6). A transept window at St. Quentin which has this peculiarity is shown by No. 298 of the 5x7 prints of 1903. For Notre-Dame at Paris the windows will be illustrated in the next article.

The facts regarding these parallel window-leans are fairly incredible from the standpoint of our present stock conceptions of mediaeval architecture as lacking in subtlety of design. Therefore special mention is now made of the large photographs in Brooklyn for the windows of Notre-Dame, to be described in the next paper. In Notre-Dame the facts are uniform on opposite sides of the church. I am unable to speak for Fig. 6 on this important point, because the leaning mullion at Amiens was first noticed in the 5x7 print during the return voyage to the United States.

It should be added that the outward leans of both sets of piers in the transepts are repeated in the piers and vaulting-shafts of the choir aisles (see Brooklyn photographs). Consequently the inclinations of the transept piers may most easily be explained as related to the widening system of these aisles, for they form a portion

of the same vista. This relation is also made probable by a parallelism of tapering (on the outer sides) in the middle series of choir piers, which are perpendicular on their outer sides, like the corresponding transept piers. This tapering adds to the widening effect of the second choir aisle. The original explanation of the whole arrangement may therefore be preferably sought in the vista of the choir aisle of which the transept piers form a portion, and for which the widening effect was considered desirable.

Leaning Triforium Transept Columns at Amiens.

Fig. 3 has illustrated the parallel leans of the triforium transept columns in Notre-Dame at Paris. These are also found at Amiens and at St. Quentin. For Amiens they are shown by Nos. 54 and 60 of the Brooklyn enlargements and by a 5x7 photograph (No. 266) which has not yet been enlarged. In this picture, which is a special detail, taken in the triforium, for the triforium columns, plumb-lines are attached to them. It must, however, be added that these minor parallel leans at Amiens are confined to the triforium bays which are adjacent to the great piers. The leans are moreover carried out in a rather half-hearted manner and the masonry is not in good condition. For a sceptic the parallel leans of triforium columns at Amiens would hardly carry conviction. It is only when they are known in such thoroughly positive and systematic appearance as holds for Paris and St. Quentin that this particular phenomenon at Amiens appears worthy of attention. At St. Quentin the triforium parallel leans are far more definite and important. They are very well shown by Nos. 37, 38, 39, 40, of the Brooklyn exhibit, in all of which plumb-lines appear.

Transept System of Vertical Curves at Amiens.

There is at Amiens a well-defined transept system of vertical curves which intersects the nave system. The widening is less than in the nave, but the curves are stronger. It is a general rule that where transepts exhibit the vertical curves the widening is less conspicuous than in the nave. This is notably to be observed at St. Quentin and in Notre-Dame at Paris. At Beauvais, however, the widening is greater in the transepts than in the choir.

The transept vertical curves at Amiens are well shown by Nos. 44 and 45 of the Brooklyn exhibit. In Notre-Dame the widening of the transepts is not easily perceptible and can hardly be more than a foot.

The Amiens Explanation of the Widening.

The interesting fact has been mentioned that the widening of the nave at Amiens has been long known to the cathedral authorities and to other residents of the town as a constructive fact and that it is believed by them to be a device for the promotion of constructive solidity and in order to throw the thrust of the vaulting directly against the line of resistance which is offered by the flying buttresses. That this theory prevails at Amiens must surely be interesting to those who have doubted the constructive existence of vertically diverging lines in mediaeval churches, on the ground that such a construction would have been detrimental to the safety of the building and, so to speak, contrary to public policy or to common sense.

It appears reasonable to suppose that movements in the masonry, due to vaulting thrust in lofty Gothic churches, would be minimized by leaning the thrust directly against the line of the resisting force. It thus appears more than probable that the Gothic builders knew that they were not risking stability by the outward leans in their lofty interiors.

On the other hand, it must be remembered that we are dealing with a local explanation which could not, and does not, take into account a multitude of facts which have been collected on this topic by the present investigation from other localities. Farther than this the explanation does not account for all the facts which are now made known at Amiens, viz. those relating to the vertical curves of the transepts, to the leaning piers of the transepts and to the widening system of the aisles.

We will first consider the local explanation for Amiens as applied to Amiens alone. It may be noted that this explanation omits consideration of the curves in the nave and does not cover the vertical curves of the transepts. (These curves are well shown by Nos. 44 and 45 of the Brooklyn exhibit.) The widening is so slight in the transepts that the curve is palpably the essential thing in that instance, at least. Moreover the thrust of the vaulting which spans the transepts is taken up laterally, for the most part, by the walls and piers of the nave and choir, and no other counter-resistance is needed.

If constructive solidity, as regards the vaulting thrust, were the main object desired we could not understand the marvellous pains which have been taken with the north and south inclinations of the transept piers. It is also clear that the bending into the nave of the lower part of the great piers at the crossing, which is a means to a widening effect in the openings from the transepts into the aisles, does not add to structural stability.

Leaving now the special problem at Amiens to consider the facts observed elsewhere, it will appear that they are sufficient to set aside the idea that constructive safety was the primary motive of the widening construction. In Notre-Dame at Paris the most pronounced widening, that of 21 inches in the second pair of piers at the crossing, is exactly at the point where no constructive danger exists. For the great piers at the crossing (Fig. 1) lean out against the resistance of the entire transept construction; whereas in the nave, where the clerestory walls are upheld only by the flying buttresses, the widening is much less than 21 inches (from 12 to 7 inches), although the curvature is stronger.

Again, if the nave widening at Paris were explained as at Amiens there would be no explanation for the convergence of vaulting-shafts in the choir. As different phases of curvature the arrangements of the nave and choir at Paris would come under one explanation.

At St. Quentin it also holds that the leans are much stronger at the transepts, where no constructive precautions were necessary, than they are in the nave. (They develop gradually in increasing amount from the entrance and are strongest in the choir.) Again in St. Jean, at Caen,* we find the widening only in the piers which lean against the transept walls, where no precautions were necessary, and in the body and choir of the church the widening does not occur. From the standpoint of optical appearances, as distinct from that of construction, we could understand that the piers at the transepts were leaned more than in the nave, at Paris, at St. Quentin and at Caen, because they were the largest and the most prominent.

Turning to the Italian churches, we find the important churches of Sta Maria della Pieve, at Arezzo, and of Trani, to be timber-roofed and not vaulted. Here, again, the explanation could not apply. Then there are the cases like the apse of the Balaban Aga Mesjid (Fig. 1, August Number), like the apse of the Schottenkirche at Vienna, like the apse of St. Radegonde at Poitiers, the apse of the Capella Palatina at Palermo, and the window of the facade of St. Ambrogio at Milan, all of which are clearly decorative instances, wholly independent of constructive considerations. For the phenomena of the entrance court of St. Ambrogio at Milan† the given explanation would not apply.

Other adverse considerations are connected with the outer leans in side aisles, which are faced by chapels having walls of such depth as to make any expedient against the operation of thrust unneces-

*Fig. 4, August number.

†Museum Memoir No. 2, Plan 1 and Fig. 10. For the window of S. Ambrogio see Fig. 9 of the same Memoir.

sary. Such are St. Loup, Chalons; St. Alpin, Chalons; St. Eustorgio, Milan; St. Ambrogio, Milan; St. Michele, Pavia.

If the stability of the building were the main purpose of this construction we should find no cause for the elaborate systems of parallel leans at points where constructive stability is not in question. For instance, let the ground-plan of St. Marks, with plumb measurements, as published in Memoir No. 2, be examined for the facts holding of the pilasters in the angles of the transepts.

From the same point of view consider the parallel leans in the vaulting-shafts of the transepts of Notre-Dame at Paris, as described in this article. At St. Quentin it can be shown beyond debate that the widenings of the openings from the transepts into the aisles can have only an aesthetic purpose, because the vaulting-shafts which are imbedded in the transept wall curve back laterally toward the perpendicular above the arches, as already mentioned. (See Nos. 37-40 of the Brooklyn exhibit.) The examination of these photographs is alone sufficient to refute the supposition that constructive stability can be the sole explanation of this device.

The explanation current at Amiens has moreover been devised to meet the peculiar conditions of the flying buttresses of the Gothic, without reference to the Romanesque churches, which show the widening construction and without knowledge of their existence.

It may again be considered a most important suggestion that the given construction would not be detrimental to stability in the naves of such churches as S. Michele at Pavia, St. Mark's at Venice and Sta. Sophia at Constantinople, but it is probable that no engineer would consider the given explanation applicable to these buildings as furnishing a primary motive for its employment.

A conclusive and most important consideration, already referred to briefly, is the one that the Amiens explanation does not consider the element of vertical curvature which appears at Amiens in the widening of the nave, but which appears in other important instances without any widening, as in the choir at Paris. In the Pisa cathedral the piers at the crossing have vertical curves which have been recently certified by the architect in charge to be constructive and which lean into the nave ($3\frac{1}{4}$ inches), without widening. The vertical curves in the Cathedral of Vicenza are found in piers which do not widen perceptibly.

The cathedral at Noyon (Fig. 7) is another instance of this class. The piers at the crossing in this cathedral curve vertically, but they lean into the nave 2 inches, by plumb measurement from the upper gallery. The piers of the nave and choir curve vertically into the nave about $1\frac{3}{4}$ inches, to the height of the first gallery, and then curve away from it about $3\frac{1}{2}$ inches up to the capitals.

FIG. 7. CATHEDRAL, NOYON. FROM THE ORGAN GALLERY.

FIG. 8. THE RIGHT SIDE OF THE CHOIR, CATHEDRAL OF LAON.

These curves are uniform in all the piers, but a photograph of smaller size than 25″ x 35″ does not show them to advantage. They are well shown in the Brooklyn exhibit (Nos. 119-122). In Fig. 7, note the plumb-lines, which are offered by the lamp-chains, which much assist in sighting for the curves. A surveyor's plumb-line is also suspended from the second bay of the gallery on the right.

An illustration from the cathedral at Laon will be another instance of the insufficiency of the Amiens explanation to cover the known facts. Vertical curves are found on both sides of the choir in the slender shafts which bound the exterior sides of the triple choir window, two sections of which are shown by Fig. 8. Each of these shafts diverges from the plumb-line about 5 inches in 39 ft. The central arch of the triple window is constructed with a widening of about 4 inches (width of the nave 36 ft.). On either side of the window the wall is solid. Above the window there is no appreciable weight, as its arches support only a light gallery. All these conditions are palpably foreign to the Amiens explanation. They react, however, as a proof of constructive purpose on the arrangements in the body of the church and choir, where delicate bends, with a widening of about 10 inches, are also found to exist (Nos. 22-28, of the Brooklyn exhibit).

Concluding Argument.

The final statement of the concluding argument against the Amiens explanation, as a primary and all-sufficient explanation of the widening construction, would therefore be something as follows: Only in infrequent cases, as hitherto mentioned, does the widening occur without curvature. The phases of the curvature are extremely varied, frequently with only such amount of divergence as is natural to any entasis, and sometimes without any upper divergence whatever. When all the known examples are considered together, including those in which vertical bends take the place of vertical curves (like St. Mark's and Sta Sophia), and including those in which the widening is found without either bend or curvature, the conclusion appears inevitable that two separate devices were easily and naturally united, either one of which might be, and either one of which occasionally was, employed separately. Both of these devices were undoubtedly aesthetic in their purpose, and of great advantage to the beauty of mediaeval building. The device which appears most singular to modern taste (although modern taste has long admired the very buildings which possess it, without having noted its importance and its relation to their beauty), was not detrimental to stability in the majority of cases

(in the opinion of the writer, as influenced by the information given at Amiens). In many cases it may have been a constructive, as well as an aesthetic, improvement and may have been employed also for that reason.

Accounts of Durand and Viollet-le-Duc.

The second volume of Viollet-le-Duc's Dictionary contains at p. 333, under the title of "Cathedral," the following passage relating to the Cathedral of Amiens:

"Cependant cette nef, dont la hauteur est de 42^m, 50 sous clef, et la largeur d'axe en axe des piles de 14^m, 60, ne s'est ni deformée ni déversée. La construction n'a subi aucune altération sensible."

Vol. II. of the Dictionary was published in 1867. Viollet-le-Duc was in charge of the repairs and restorations at Amiens from 1849 to 1874.

This passage would seem sufficient to establish the fact that the spread of 33 inches (2.80) in the nave at Amiens is not accidental. No vaulting could spread to that extent without collapsing, and we have the above assurance of Viollet-le-Duc that no perceptible distortion or warping has occurred in this nave.

Viollet-le-Duc's statement is supported by the recent work of M. Georges Durand,* who furnishes a complete history of the repairs of the Cathedral, based on its archives. As regards the vaulting of the nave, only one repair is quoted. It took place in 1805-6, when the vaulting at the crossing was observed to have settled *three inches* ("trois pouces"). This occasioned great consternation, and the repair of the affected masonry by means of iron cramps, was accomplished by the workman who had discovered the depression (p. 155, Vol. I.).

This record has significance in two directions. It not only indicates the extreme amount of depression which has occurred in the nave vaulting at Amiens, but it also shows what danger of collapse may be connected with a very slight accidental settlement.

It needs no argument to show that there is no relation between a settlement of 3 in. and a spread in the nave piers of 33 in. Three inches of settlement in a vaulting means three inches of spread between piers.

From the accounts of Durand and Viollet-le-Duc, we may argue that no special importance attaches to the alarm which was raised about 1805 by M. Grandclas, engineer of roads and bridges for the Department of the Oise, regarding the Cathedral walls.† Durand intimates that self-interest may have had a share in raising this

*Monographie de l'Église Notre-Dame, Cathédrale d'Amiens, Paris. A. Picard et Fils. 1901.

†Durand, Vol. I., pp. 160-162.

alarm, and records the fact that representations were filed with the Prefect, opposing those of Grandclas.

Both Durand and Viollet-le-Duc describe the chain of iron bars which was stretched in 1497 throughout the triforium, in order to stay the great piers at the crossing, which were thought to be bulging inward under the weight of the tower.*

As regards the Cathedral of Amiens, the question of the constructive existence of vertical curves in the nave cannot be separated from the constructive existence of the widening. If the widening be constructive, the curves by which the widening is obtained must also be constructive. The amount of this widening is so great and the records of repairs are so complete that the widening must be accepted as constructive. If the widening has been accented or augmented accidentally at any point, it has not been increased more than three inches.

Wm. H. Goodyear.

(To be continued.)

*Durand, Vol. I., pp. 61, 205. Viollet-le-Duc, Vol. II., p. 404. The latter supposes this tower, which was burned down in 1528, to have been of timber and stone, but Durand shows that it must have been wholly of timber, like the shorter one which replaced it.

THE "CREHORE" SUN-DIAL.

Manufactured by John Williams. Invented by Albert C. Crehore.

FIG. 1. THE NEW YORK STOCK EXCHANGE.

Broad Street, New York City. Geo. B. Post, Architect.

FAÇADE OF THE NEW YORK STOCK EXCHANGE.

THE Stock Exchange building in New York City faces on one of the broadest streets in the older part of the town. In spite of this, the high and wide façade of the new building cannot be made wholly satisfactory in a photograph. Figure 1 gives the view which is the best known aspect of the building. It is somewhat in this way that the front looks to the crowds who fill Broad Street for many hours of the business day; they having also the advantage of changing the point of view at will. It is best for us to refer continually to this view as representing truly that result which evidently architect and sculptor had in mind. By entering one of the office buildings opposite, and placing the camera as in making the illustration Figure 2, a front view is obtainable, indeed, but neither architect nor sculptor could have expected many persons to examine the building in that way.

To speak of this front in the first place according to the traditions of our schools, accepting the use of the Roman Corinthian order and therewith, as forming part of it, a triangular pediment, there is much praise to be given to certain parts of the design, and those the most striking and the most brilliant. In studying this we shall have to refer to Figure 2, in spite of the violent perspective taken from a point nearly opposite the median line of the front and much too near it, for the ordonnance of the front can best be understood by a comparison of these two pictures. A portico of six columns between two antae is raised high above the street upon a basement which has been made as solid as practicable. The colonnade, on the other hand, is entirely open, without masonry backing of any kind, without pilasters on the axes of columns, without a rear wall of any sort—in fact, with nothing to represent the enclosing wall of the building except sash and glass and such sunblinds as the in-dwellers have thought fit to put up. It is, in short, a screen of columns such as, if on the ground-level, would mask an entrance-way or partly separate two great halls. The entablature is made to look unusually heavy by the extremely massive carving of the frieze, and by large modillons left in the form of square, sharp-cornered blocks—instead of the more usual scrolls, sculptured on the under face of the double-curved surface. The pediment itself is of the usual and accepted proportions, although the right-lined modillons therein have an odd effect under the raking cornice, insisting strongly, as they do, upon the diagonal shape, with all their strongly marked principal lines aslope. The attic

FIG. 2. THE NEW YORK STOCK EXCHANGE.

Broad Street, New York City. Geo. B. Post, Architect.

wall, against which the pediment is seen in relief with but a slight projection of its roof beyond the vertical surface, has been treated with a curious system of recessing as for a panel, one inset within another, and this with the apparent purpose of seeking a strong differentiation from the flat wall beyond, on the left (see Figure 2) which might otherwise assert itself too much as part of the front—for part of the design it is not. Care has been taken to insist upon the slightly projecting square pilaster-like piers on either side of this attic, for these carry up the lines of the antae, or at least would be seen to do so if the building could more readily be examined from a point opposite to its centre line, as in Figure II. The whole of this attic, together with the piece of wall on the left, is crowned with a parapet, heavy, but not too heavy for the mass below, and with large pedestals which again insist upon the strongly marked verticality of the antae.

The reader will see why it is necessary to turn continually from Figure 1 to Figure 2. These classical façades of columnar architecture which for so many centuries have been laid out upon vertical and horizontal lines, whose relation one to another has been accepted as of extraordinary importance, are not to be judged by their resulting effects alone. To find the designer's intent, always the important thing in criticism, one has to go back of the finished work, very often. The question what the draughtsmen were doing over their drawing-boards, and how the thing seemed to them as they laid it out in geometrical elevation, cannot be lost sight of with propriety. The accepted relation of part with part, admitted conventions centuries old, cannot be judged finally in the building as taken cornerwise, seen in perspective. The student must be allowed to stand directly in front of it, and to go back from it in thought to the working drawings after which it was built.

So far we have accepted the front as a piece of admittedly neoclassic academical work, but there are one or two points on which, for better or for worse, the academic system has been abandoned; and first, to name an instance of such breaking of rules, the result of which is triumphantly good, let us consider the treatment of the capitals which crown the great antae. It was a bold thing to do, having put up those huge square piers terminating the portico at the north and at the south, and enclosing the more slender though still massive columns between them—it was a bold thing to give them capitals and bases exactly corresponding to those of the columns. That is not according to the rules! and yet see how fortunate the result has been, and therefore how sagacious we may think the designer of the thing, how well advised in laying out his work. He felt that his decorative front of 110 feet, more or less, did not allow of quite enough columns. The effect of a colonnade

depends largely upon its length relative to its height, and still more upon the frequent repetition of similar parts. In order to obtain such length, such continued succession, the designer has bethought him of increasing his six Corinthian capitals to much more than eight, at least in appearance, by putting in those very broad crowning members of the antae, for they are very broad. If the shafts of the columns are four feet eight in diameter at the top (this is a mere guess, or inference) the antae are eight feet wide on the front, and they look still larger than this dimension alone would make them because they also have their thickness and their reveal of six feet or so. When seen as in Figure 1, the capitals of these antae look fully twice as large horizontally as the capitals of the columns. It is to be insisted on, then, the altogether happy effect of this rather bold invasion of the usual proprieties. Even when seen in steep perspective, as in Figures 1, 4 and 5, there seems no serious breach of good taste, even in the prolonged hollow curve of the abacus as seen in these great square caps, nor any harm done in the apparent lengthening of the whole face of the capital as if the round detail had been "developed," as they say in descriptive geometry. Meanwhile there will hardly be two opinions about the happy effect produced by taking up the whole length of the portico for the repetition of the Corinthian capital and base, giving to a hexastyle the grandiose appearance of a much larger and longer colonnade.

It is the great richness of effect produced by this long row of elaborate pieces of leafage which carries off what would otherwise be the undue extravagance of the frieze. In itself, the frieze is a little violent. The label or panel, upon which are carved in relief the letters "New York Stock Exchange," occupies rather more than half the length of the frieze, and the contrast between it and the extremely deep and heavy sculptured foliage beyond on either side is great and sharp, in spite of the very fortunate thought of a rosette introduced at either end of the lettering to break the violence of the contrast. It is hard, however, to see in that deeply cut scroll-work a wholly fortunate piece of ornament. It is not as refined as that of the capitals. The very delicate sculpture of the cyma recta above, forming the crowning member of the cornice, contrasts in a way not wholly fortunate with the scroll-work to which allusion has been made. These inquiries into the refinements of the design will seem to some persons rather vain when applied to so careful a study of Roman work of the Imperial epoch; but there are fine things in the art of that period and many things not so fine. There is delicacy and there is a harsh excessive insistence. There is, in sculpture especially, an extreme refinement, a refinement as of the Italian fifteenth century, contrasting with an almost barbarous tendency to excess. And, because of these divergencies in

classical Roman practice, it is worth while to consider the degree of excellence reached in the ancient and the modern building of the style.

As for the feature of this building which perhaps has attracted the strongest animadversion, the relation of the colonnade above to the basement which supports it, there is certainly a lack of adequate solidity in that basement remaining in spite of the deliberate reduction to the smallest possible space of the window and door openings—the increase to the utmost of the piers between them. This is evident even in the front view (Figure 2); and we are reminded once more how these neoclassic designs are made in elevation, flat, with but little consideration of their look in perspective; but in Figure 1 it is more noticeable because the reveal of the arched windows is seen to be inadequate. The wall looks thin. But then no one has ever found an adequate solution of this problem: To support aright the great order when in an upper story. The two admirable buildings which front the Place de la Concorde on the north, those splendid structures by Gabriel, one of which is occupied by the French Navy Department, suffer in the same way. They have each a noble colonnade resting upon an arcade of very solid stone-work below, with the piers of course on the axes of the columns, but neither from the front nor as seen anglewise is the basement quite as massive as it ought to be. As to the basement of the magnificent colonnade which forms the east front of the Louvre, anything more trivial than those windows with the segmental arches, with crossets to break the architrave and the senseless keystone in the middle, even the nineteenth century never produced. One does not blame Louis XIV for having chosen the design. He, with his notions of what was grandiose, could not fail to admire this ordonnance of coupled columns, but he did not look so close as to ask how the basement wall was to be designed, and the result was that it never was designed at all. One recalls, in this connection, the fact that the author of this front was not an architect, nor a sculptor, nor a practical student of art in any form, but a learned physician, whose familiarity with Latin had brought him to translating Vitruvius.

This much, however, is evident enough—the requirement, the supporting of a heavy colonnade high up in a front, is one which it is almost impossible to meet. The Romans of the classical times did not raise great colonnades high above the site. Such marble columns as these were not asked to dance in the air as it were—they were allowed to stand firm on Mother Earth, and they lent strength to the building instead of needing to be nursed, to be handled carefully and held up with pains in a place unfit for them. No one can blame the modern architect for resorting to this de-

vice which has now become so common. No one stops to think, when he has a front to make splendid in a neo-classic style, but hoists his colonnade into any situation. And yet the superimposition of two smaller colonnades, as in front of St. Paul's Cathedral or the dome of the Invalides, or the coupling of the columns above the high basement, so that they become smaller and slighter, as in the Louvre colonnade or the Radcliffe Library, seems to be open to less objection and to be the natural way to treat the classical orders, always excepting the case of the Pantheon and that of the Panthéon, where they can stand at the level of the site or be raised above it merely by the height of the stylobate. This height may indeed be considerable. The podium upon which rests the order in the most important Roman temple remaining to us, the Maison Carrée at Nimes, may be nine feet high, but it is a perfectly solid wall with a surbase. The smaller temple at Vienne on the Rhone has a similar basement wall. The three well-known temples in the Forum (those of Castor, Vespasian and Concord, to use their common appellations), that of Fortuna Virilis, that of Mars Ultor, as far as we know it, and, out of Rome, the temples of Theveste and Sbeitla in North Africa, the gateway-colonnade of Baalbek and that at Damascus, the Gerasa and Palmyra colonnades—every image that the memory calls up of Roman practice with big columns is of them standing solid on the ground. These seem to be the conditions under which a classical colonnade of large size can do its work properly; and that of the Stock Exchange is assuredly large enough in the scale to need every preparation for its great apparent weight. In such a case the critic is expectd to be, as they say "constructive" in his criticism, and this phrase seems to mean that he should be ready with an alternative suggestion as to anything which he dislikes. Denying absolutely any such law as that, for criticism is not creation but discussion—not synthesis but analysis—I may still offer in such words as those used above, that the solution of the difficulty which no designer yet has mastered (avoidance of the difficulty, might be a better term) which consists in refusing to use the grand Roman colonnade in American street architecture. It has no place there, because it is absolutely out of scale. Figure 1 shows that, showing as it does the many-storied structures around, six or seven horizontal bands of small windows in the height of this single colonnade with its basement, ten at least in the whole height of the composition, including the pediment. Fig. 3 carries this comparison farther. In the background is seen the sub-Treasury building, once the custom house, which was begun in 1835, at a time when the dwelling houses and banking buildings near at hand were lower than itself though standing where now towers the three-hundred foot Continental Bank building and

FIG. 3. THE NEW YORK STOCK EXCHANGE.
Broad Street, New York City. Geo. B. Post, Architect.

the neighboring masses of almost equal hugeness. Out-reached and out-massed as it is to-day it is still much larger in scale than the skyscrapers near. Their unit of design is a story of offices twelve feet high; while that of the pseudo-Greek Doric portico has the other scale—that of a great hall thirty feet high set upon a lofty podium. The Roman Corinthian colonnade of the Stock Exchange is in good historical and artistic proportion to the Grecian Doric order of the sub-Treasury. It is so that the temple of Mars Ultor would outclass the Parthenon if they were brought together within a single forum, and yet the two buildings standing each for a spacious single hall and each of one story might keep each other company without offending the proprieties. If the colonnade of the Stock Exchange stood on a solid podium ten feet high, without openings at all we should have what many a market-place had to show, in the lands of the Mediterranean empire. But the twenty-story buildings near are of another world—of another standard; of another scope. Even the six-story front still left on Nassau street beside the towering Continental Building is out of scale with these colonnades.

And yet, as if to show us, writer and reader alike, that there is no hard and fast law in fine arts, we have to stop and recall the fact that here is a gigantic window made necessary, as it were,—that there is at least a wall over a hundred feet long and seventy feet high which may be opened up in one huge window, as it must needs be pierced for the passage of much daylight. So far, then, that wall in its exterior appearance is almost of necessity out of scale with the buildings near. The question remains as to the wisest treatment of such a wall, that this excess of bigness in one feature shall not overwhelm all else.

In this way we pass insensibly from the treatment of the design according to its own principles, to the examination of its propriety, of the propriety of those principles themselves. Let the reader look at Figure I and see whether this pediment which is not the end of a roof, has any fitness at all. The Grecian temples, all of them, had a pediment at either end; it was the triangular wall which stopped up the open end of the double-pitched ridge-roof. The Roman pediments which are built on the Greek plan, very numerous in all parts of the empire, were built in the same way, that is, like the one at Nimes and Vienne already named. Back of the raking cornice of the pediment continues the low pitched, tiled, roof-surface, of which, indeed, that raking cornice is merely the moulded frontispiece, corresponding exactly in its slope with the slope of the roof. Now, to take such a pediment, made very small, and put it over a window and then call it a *fronton* is one thing—that is not now under consideration. To erect a pediment on a great scale,

covering and crowning the whole of a great and ponderous colonnade like this, and then to have no roof behind it, but to stop it against a blank, smooth, vertical wall, is to invite most unfriendly comparison. And what makes the resort to that triangular pediment more surprising is that the ablest, at least the most powerful and efficient sculptor of the time and place, was to be called upon to fill that unlucky triangle with his composition. It is quite well known that he longed to fill also the two triangles above, or in other words, the broad horizontal band against which the pediment is relieved; but since that is so, how much nobler a thing it would have been, the whole broad band—seventeen or eighteen feet high if we take the stature of the central figure as our standard, and stretching from end to end of the colonnade. Can any one tell us why those columns and antæ should not have supported a horizontal band as well as a pediment? Roman example! The Romans offer no example of the pediment with no roof behind it. In the portico of the Pantheon, although recognized as a solecism in its present state, a solecism to be accounted for only by the building in of the rotunda of Hadrian behind and upon the earlier portico of Agrippa—even that has a roof behind it, although it be but the roof of a deep porch.

In this connection the front on New Street may well be compared with the elaborate façade which our figures show. It is impossible to show that front aright in a photograph, for New street is hardly a quarter as wide as Broad street where shown in Fig. 3. The building occupies the whole plot of ground; a huge room nearly square is carried through from street to street; the smaller and accessory rooms, corridors, elevators, stairs and the rest, are disposed of in irregular triangles, part of the plot on either side of the great hall. This accounts for the principal story, that whose floor is on a level with the very clumsy little stone balconies seen in Figure 2 and whose invisible roof, or ceiling, is on either side not far above the top of the Corinthian capitals, while in the middle it rises higher. There is one story below the floor of this great room, and this is taken up by lobbies of entrance, the access to elevators and the like; and on either side the entrance to the safe deposit vaults, and telegraph offices. The larger door to the south, on the left in Figure 2, is the entrance for strangers to the gallery, where alone they are admitted, which gallery has its floor on a level with the bases of the colonnade. Above the ceiling of the great hall are here two, there three, stories of much smaller rooms, used for the lunch-rooms and kitchens of a semi-private club.

Now, on New Street the front betrays all this interior lay-out, and the colonnade, which there corresponds, detail by detail except in decorative treatment, to the Broad Street colonnade, appears

like what it is, the decorative fitting of an enormous window. Now as to the propriety of using that colonnade, like the one in our picture except that it is of inferior splendor, the columns not fluted and the material less costly—the propriety of such a use for a huge portico of heavy columns may be questioned, of course; but at all events that front is realistic in a way. It shows what the building behind amounts to in the way of accommodation and construction. The wall above that colonnade is filled with good-sized windows in two stories. The wall at the side of it is filled with similar windows in four stories. In other words, the huge window comes in, here, as a perfectly explicable feature of a building which contains one enormous room and many much smaller ones. Now on the Broad Street front the treatment by reason and logic has been abandoned for the presentation there of a prodigious piece of decoration. And let us see whether our reasoning after the event will show us why the piece of decoration took the peculiar shape which it has taken. Why is the pediment put there? Probably because the architect of the Stock Exchange, Mr. George B. Post, has always known how to secure for his buildings the services of the first mural painters, the first sculptors on a grand scale—the best men of his time; and because there was here one more great chance. Again and again in his active and most successful career he has enlisted the services of those painters and sculptors whose work is the most powerful and effective, and whose fame he himself has done so much to perpetuate. So in this case he has felt that, apart from the dignity of the Roman frontispiece, there was also the opportunity to fill the pediment with Ward's brilliant and powerful sculpture.

But the reader will ask, why the triangular pediment for that purpose? Assuredly that is not a fortunate shape for a panel in which heroic sculpture is to be placed! If the Greeks and after them the Romans filled the pediment with sculpture, that was because the pediment had to be—because the end of the roof was of necessity an isosceles triangle, low and very broad; but certainly it never was and never could be an ideally good place for sculpture. Why could not those columns have carried a huge frieze as high at either end as in the middle, and thus have given to Ward an opportunity to produce a grandiose composition indeed—a band of sculpture eighteen feet high and at least one hundred and ten feet long? That would have been an achievement worth recording!

There are two reasons, which every architectural designer would at once find in his thoughts—two reasons for using the pediment. The first is that it might be thought relatively easy to convince the committee that a pediment needed sculpture. Examples of that combination of an architectural form with statuary could be produced by the score; not ancient ones only, but modern examples as

well, pediments from all the great capitals of Europe. It might have been thought far less probable that the still larger and rectangular space would have seemed to those holding the purse so absolutely in need of sculptured composition which should fill it. But another reason exists, as has been said above, and it is in every one's mind. "The classic is a soft snap;" which slang phrase was really used by a powerful architect of to-day, in conversation with the critic who printed it afterwards without its author's name. The classic is easy; that is to say, our books are full of it, our draughtsmen know it, the proportions of it are fixed, or are quite easy to determine, the draughtsman at five or seven dollars a day is just as competent to fix upon the conditions of it as the most subtile designer alive; in short all that facility which comes of long experience is there to aid the designer of Roman colonnades, and he thinks himself entitled to make the most of that experience, to take advantage of that opportunity, to design as his predecessors have designed. And he is right, so far. All great designing has come in that way. The difference is that in the days when architectural designing was as possible as landscape painting is to-day or when, as we say, architecture was a living art, the forms used by the designers were those which had become inevitable in the due course of daily planning and building; whereas with us this Roman *défroque* has no reason for being, and "The Man in the Street" accepts that pediment and all that accompanies it as something of which he cannot form any opinion at all, it being as he thinks, one of the freaks of the architect into whose habit of mind he (the Man in the Street) does not pretend for a moment that he can enter.

The conditions of these modern classical monuments, copied as they are in part from buildings of the sixteenth, seventeenth and eighteenth centuries, and partly from details measured and drawn carefully from the ruins of ancient Rome, are peculiar. The artistic material is stored in so many huge and costly volumes, Italian, French, German and English, presented under respected and honored names—Blondel, Chambers, Chipiez, Du Cerceau, Fauré, Geymüller, Letarouilly, Normand, Palladio, Papworth, Rouyer and Darcel, Vignola, not to name a host of modern reissues, restudies, and handy books of reference—that no redistributor of ancient forms need go far away for the principles upon which his work is to be done. Granted a little pecuniary success, and he has the books at his hand; accepted the humbler position as of a beginner in design, and he should have all the important books near at hand in a public library—in a great city he will have most of them. And this is what is meant when such profane remarks as the one quoted above

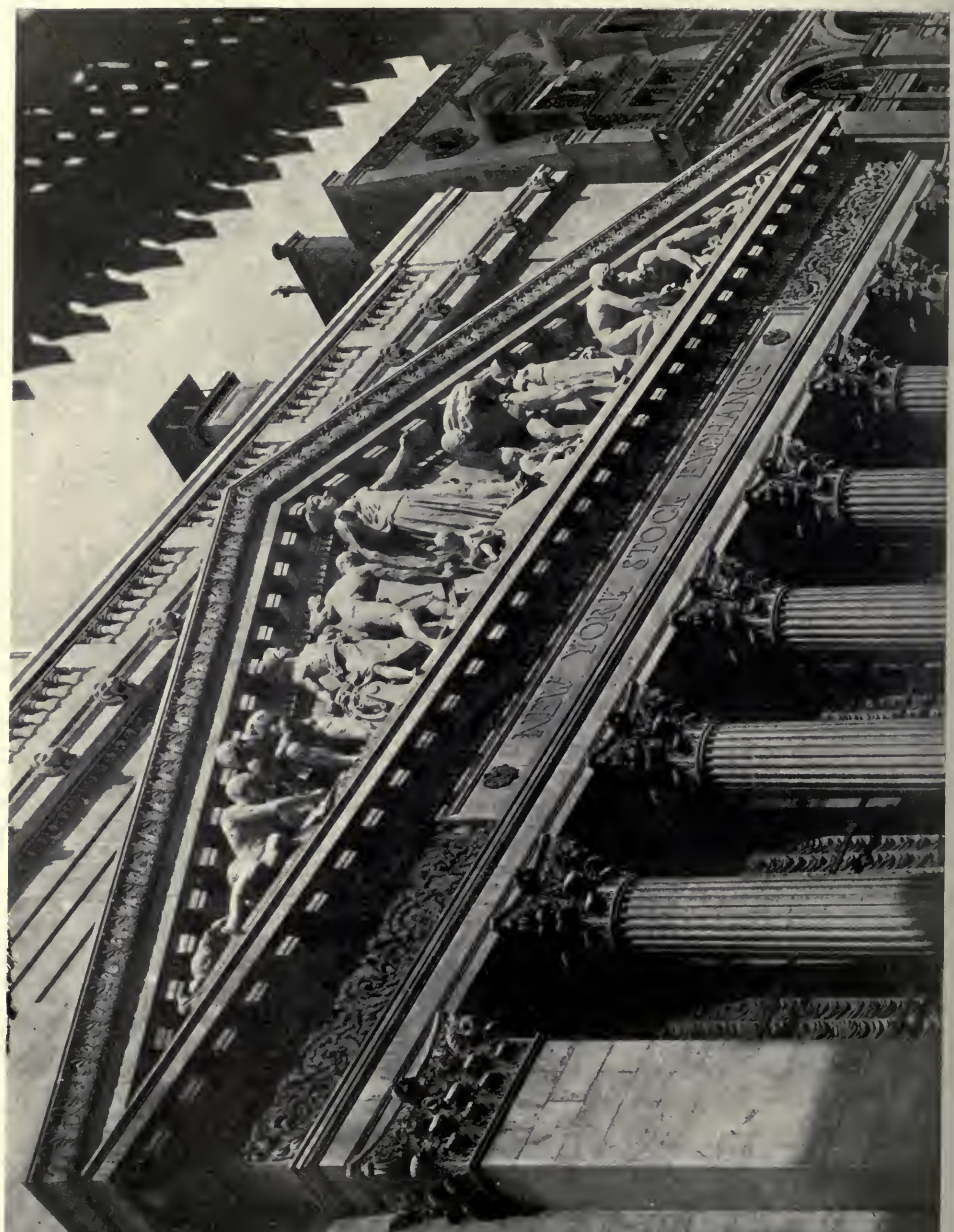


FIG. 4. THE SCULPTURE IN THE PEDIMENT OF THE NEW YORK STOCK EXCHANGE.
Geo. B. Post, Architect.

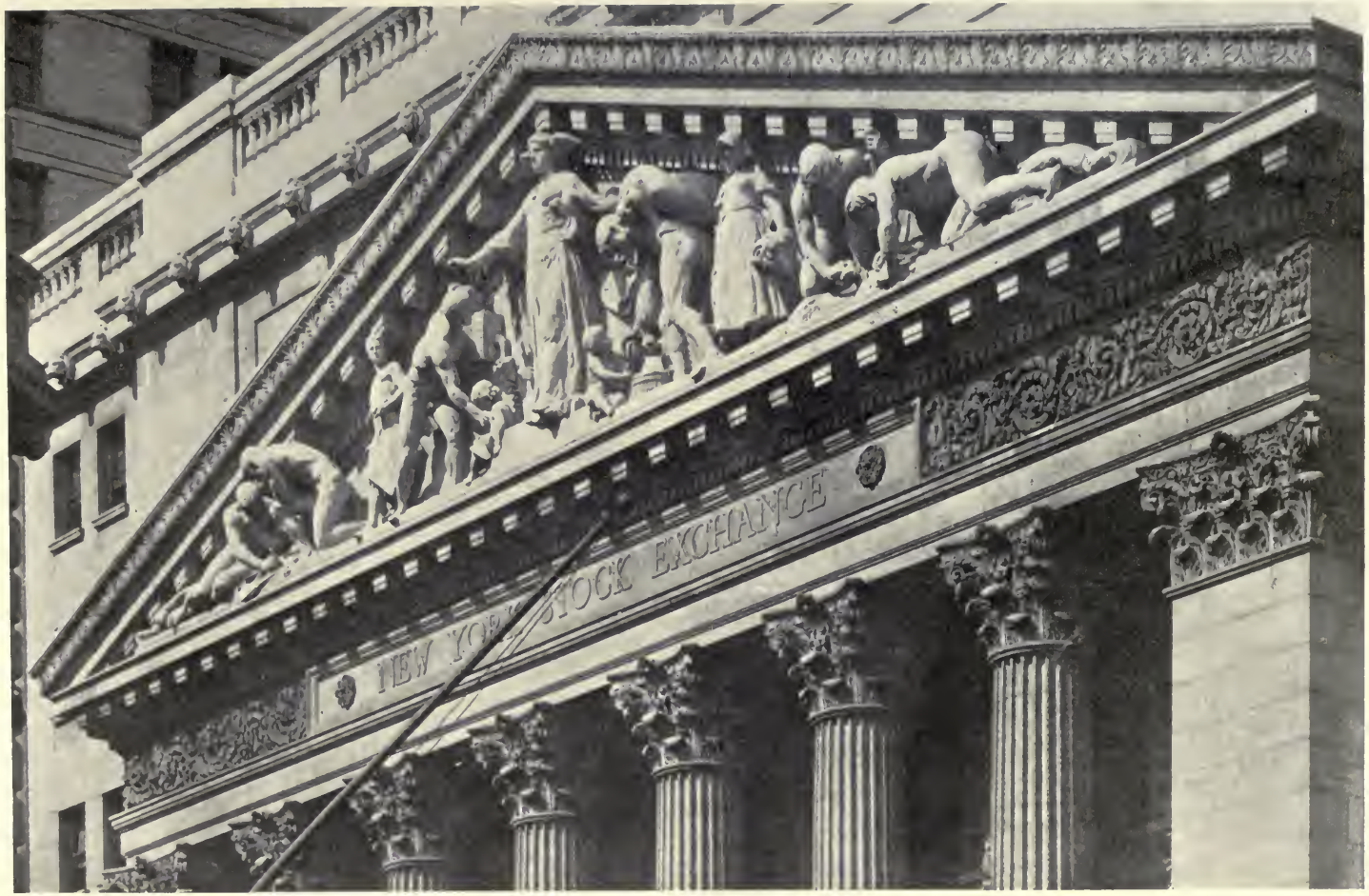


FIG. 5. THE SCULPTURE IN THE PEDIMENT OF THE NEW YORK STOCK EXCHANGE.

Geo. B. Post, Architect. J. Quincy Ward, Sculptor.

FIG. 6. THE SCULPTURE IN THE PEDIMENT OF THE NEW YORK STOCK EXCHANGE.
Geo. B. Post, Architect. J. Quincy Ward, Sculptor.

FIG. 7. THE SCULPTURE IN THE PEDIMENT OF THE NEW YORK STOCK EXCHANGE.
Geo. B. Post, Architect. J. Quincy Ward, Sculptor.

are accepted as true by those who do not believe in this continual revival of that which has been so often revived. When the French visitors to the Chicago Exposition made fun of the designs of the great buildings there, saying, to their designers in some cases, and saying of them everywhere, that these were their school problems brought out of the old portfolios and called to life for the occasion, the answer was—Does the reader know what the answer was? It was gravely set up, as a sufficient explanation of that elaborate system of copying, that the important thing seemed to be to teach the American public what good architecture was. The architects would have preferred, so very much, to have made designs strictly in accordance with the time and place, with the construction in iron and the vastness of the scale required—yes! they would have preferred so decidedly to have done that—but then where would have been the valuable instruction of the great West in accepted classical architecture? And the reader is to remember that there is much confusion caused by the duplex meaning of the word classical! That word carries with it the notion of something admittedly superior or even supreme, even when it is used to denote an epoch or a style of building. And so it was that the designers of those fronts in Chicago persuaded themselves that the work which they did in the easiest and quickest way, as they had a perfect right to do it, under the conditions of hasty preparation and temporary endurance, was also in a mysterious way for the good of the public. Not to make a design at all, but to redistribute the same old columns and entablatures—that was assumed to be the best thing that the able architect could do for the artistical education of his fellow-countrymen.

With this we pass to the sculpture of the pediment and note once more how much the community owes to the high-minded resolve which has brought about this splendid adornment of the latest costly front. Note, too, the manly way in which the sculptor has improved the opportunity given him by the architect, how gallantly he has faced the very difficult question of filling that sharp-pointed triangle with refined and shapely sculpture. We are not likely to approve, on second thoughts, the suggestion of breaking waves in the carving at the two extremes of the pediment. Whether that means The Breadth of the Continent Bounded by Two Oceans, or not, is indifferent, for it cannot be called a fortunate motive in sculpture. And again when the unsigned newspaper criticisms ask why the difference in scale among the figures, why the perfectly formed young man on the left and the fully developed young woman on the right are only waist high, or little more than that, to the colossi near them—it will not be possible to find a wholly satisfactory answer. Admitting those doubts and questions and

not asserting for a moment that the highest reach of grace and charm is to be found here, we have still to rejoice over one of the most manly, strenuous and really formidable pieces of sculpture of modern times. Who but Ward would have dared to undertake that which to this present writer seems the boldest thing of all, the modelling of those tremendous statues on either side so that they fill with perfect harmony the tapering slope at either end of the pediment? On the left (see Figures 4 and 5) a pair of them are laying out a piece of ground or locating a building; on the right the other couple are prospecting for a mine and comparing the mineral fragments which they hold. Figure II shows all this in flat elevation, but the reader is requested not to use this picture otherwise than as a map—a diagram—for convenience of reference. The reader is reminded that the sculpture is planned with a special view to its position on a street, and therefore to be seen only from below and, as a general thing, at a steep angle from the right or from the left side. For the effect of the statuary, therefore, he should look (if the building itself is not within easy reach) at Figures 4 and 5, and not at Figure 2 at all. These figures show how the two surveyors are intended to be seen, and also how the two miners were in the sculptor's mind; and Figures 6 and 7 explain more fully the double or triple group in the middle of the pediment, and this also nearly as it looks to a careful student who walks through Broad street seeking for a point of view.

In Figure 6, then, we have, as seen from across Broad street and high up on the left first the slender young man already mentioned, who seems to be grouped with a dynamo as an impersonation of electrical power. The mighty giant next to him deals with cog-wheels and cold chisels, and seems to be concerned with an immense plate of metal which is to be rolled flat and riveted. On the right the small female figure holds a distaff and has her left hand on the head of a ram. And on her right is the Farmer, bending under the weight of a great sack of grain which he is beginning to pour out with careful adjustment into a measuring basket at his feet. The central figure is Integrity—but this central figure is not the most important part of the composition, which, it seems, resolves itself into the two magnificent groups at the two ends of the pediment and the two last described above and which we call Industry and Agriculture.

As regards the details of the sculpture, the artists (for Paul Wayland Bartlett was associated with Ward throughout the preparation of the model) have chosen the extreme of muscular development, working on the lines and in the spirit of the Louvre statue which used to be called the Borghese Gladiator. Or one

might compare the treatment with that of the famous Pergamon frieze, the combat of the giants against the gods; not that the modelling is alike in the modern and in the ancient work, but that a similar desire to insist upon the visible facts of muscular development appears in either case. The difference between such treatment of the body and limbs and that which we find in, for instance, the Apoxyomenos of the Vatican, is evident enough, and we need not be concerned with deciding absolutely in favor of either treatment. The three pieces of antique sculpture named above are taken of the same epoch, that we might note the reserved treatment and the realistic treatment of the vigorous body as seen by different artists of the later and more studious times of art, the Hellenistic epoch. We have no right to ask the modern sculptor to deal with the type of the age of Phidias. The seated Theseus or the reclining Ilissos of the Parthénon may be to art students occupied with comparative thought, finer things in sculpture than any product of later times; and yet we cannot ask the twentieth century sculptor to deal with those early works as his chosen type. The Doryphoros in the Naples Museum, the Diadumenos in the British Museum, the Hermes of Olympia—lovely as are those works of a time earlier than the conquests of Philip of Macedon or than the first expansion of the Roman power beyond the limits of Latium—indeed, with the Parthenon sculptures, our most perfect types of artistic treatment of the nude male body, represent an art of convention in the most strict sense of that term; and we have no right to expect that any modern sculptor should study himself into those conventions, and adopt the habit of mind which would enable him to design in the same way.

At the same time it must always be a grave question how far stateliness and monumental grandeur may be injured by so much detailed realism, and how far the study of the living model should be allowed to control the handiwork of the artist when there is question of stately design. Strong and real as are the sculptures of this pediment, the question as to the real beauty or the real dignity of the result must arise in the mind of every careful student of the composition. Let the reader go, five or six times on Sunday mornings or long summer afternoons, to study this piece of associated sculpture, and he will find in his heart much sympathy with the artists who were driven by the conditions of the work to the few, very large figures; to the great projection beyond the geison of two at least of the kneeling or seated statues; and to the rendering of such emphasized muscular development as is visible here. And the result is exceptionally strong and real: even if the ideal architectural treatment of sculpture be postponed until a day of more general use of such stately adornment.

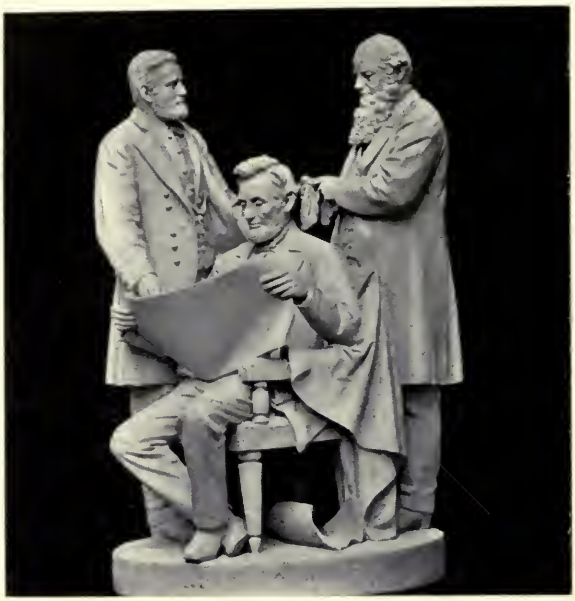
Russell Sturgis.

JOHN ROGERS: SCULPTOR.

THE passing of John Rogers marks the end of an era in American sculpture. During a period barren in all evidences of public interest in the sculptor's art John Rogers aroused an amount of popular enthusiasm, which has not been equalled by a single one out of the hundreds of more talented and virile American artists who have succeeded him.

This enthusiasm may not have been based upon any sound æsthetic principles; but it needs no apology. His homely works given to the public at a time when an appeal to national sentiment found prompt response, went straight to the heart of the American people. They did not require the explanation of guide books or critics to be understood. They did not hark back to the classics. Their subjects were to be found in the daily life of the average man, and notwithstanding their many shortcomings in *technique*, artistic conception, and methods of treatment, they stood out boldly as the first popular appeal that sculpture had made to the American people.

Compared with other nationalities we must reluctantly admit that even to-day our people take scant interest in the fine arts, and in Rogers' generation art was something unknown to the average American and even scorned by him. This scorn was in part the result of ignorance due to an unsuccessful effort to appreciate the work of the classicists of the period, who presented for the admiration of the common people the immortal Washington dressed as a Roman Senator, and their great Chief Justice arrayed in a toga.



THE COUNCIL OF WAR.
John Rogers, Sculptor.

These sincere men who had given a classic tendency to art for a half century had preached a gospel which was meaningless to the greater part of the American people, to whom Greece and Rome were simply names. They appealed only to the classically educated. Their art was learned. It had no message for a democracy in an undeveloped country where working with the hands was the rule rather than the exception.

The study of psychology played no part in the programme of the American classicists who wondered at the lack of appreciation in a heterogeneous population whose keen intellects would have immediately grasped an idea within their ken. If France admired, they asked, why should America not follow. A large part of the American people had enthusiastically received Citizen Genêt and had paid abject homage to the politics of Republican France under the leadership of Jefferson. Citizen Genêt was the personification of republicanism, and as such he was welcome. But though Jefferson was a republican in politics he was an aristocrat in art. Monticello marked the parting of the ways. The people did not follow. They wanted something they could understand.

The classic revival had been carefully nursed and fostered for many years by a few enthusiasts whose cravings for archæology blinded them to the beauties of their own time. Greece was free, the Elgin marbles were carefully housed in the British Museum. There was no Byron to sing an ancient civilization to popularity. The structure had outlived its usefulness. It was falling of its own weight.

The leaders in the protest against these all-pervading classical tendencies in England and America were all more or less pedantic, and the dogma that Eastlake wrote and Ruskin preached is now obsolete and forgotten. But its effect remains. They laid a broad

foundation for the more catholic art of to-day, and their very dogmatism laid it the more firmly. In this small group of men Rogers was a leader; not through what he said, but by what he did. The literary protestants were still aristocratic. Their tirades were read widely,—but by the educated few. The work that Rogers did was its own protest. It was democratic. It reached the many. It was seen by thousands where the words of the writers were read by hundreds. The "Rogers Groups" were reproduced in such commercial form that they were within the reach of the average man who saw in these little putty colored models a faithful picture of his own life and his own emotions.

He had a son or brother in the armies of the Union, and the artist fittingly appealed to him in a manner that was keenly personal in such groups as "The Council of War," "News from the Front," and "The Returned Volunteer."

Hence in every darkened parlor in the loyal states a "Rogers Group" kept silent company with the badly painted family portraits and the haircloth furniture, and was a perpetual reminder of the family's interest in the struggle for national existence. This holy-of-holies was carefully shielded even from the light of day and it was indeed a privilege to enter the sacred precincts of this darkened room where in the place of honor stood the "group," not always beautiful it is true, but representing something vigorous and alive, something which even the children understood as they cautiously opened the door and peered in through the gloom.

John Rogers first saw the light in Salem, Massachusetts, in 1829, where his father was a merchant, and early in life he was sent to Boston to learn the dry goods trade. A few years later, having found commercial pursuits unsuited to his temperament, he drifted into the machine shops, in which he worked both in the east

THE SLAVE AUCTION.
John Rogers, Sculptor.

and west until 1857, when he determined to cultivate his talent for modeling which he had previously practiced as an amateur. As a preparation for his new work he spent about a year in Europe, from which he returned more determined than ever to adopt the career of a sculptor, but quite uninfluenced by the classic tendencies which had surrounded him in the galleries of the old world.

From the first he met with more than moderate success with his "Checker Players" and other *genre* subjects. In the early days of the civil war he produced "The Slave Auction," which fortunately attracted the attention of Henry Ward Beecher, who immediately recognized the value to the abolition cause of this popular work.

THE RETURNED VOLUNTEER.
John Rogers, Sculptor.

This patronage gave him an earnest and enthusiastic *clientele*, and a larger audience eager to applaud. His other groups, mostly of war subjects, followed during the succeeding years, and on these works his fame rests.

His excursions into the more serious realm of sculpture were few, the equestrian statue of General Reynolds in Philadelphia being his best known work. They added nothing to his reputation. Other men were coming to the front whose portrait statues were equally mediocre. His story had been told in his "groups."

During his later years John Rogers was but a name to the American people. He had no permanent place in the newer American art. When he died on the twenty-seventh of last July his death

hardly caused a ripple, but he served his day and generation well. It is unfortunately the custom of the American sculptor of to-day to forget John Rogers when he names the list of men who have given life to plastic art in the United States, and who have made possible the sculptural decorations of St. Louis and Chicago. But notwithstanding this lack of appreciation on the part of his successors, Rogers' name is firmly fixed in his nation's history. He was the first American to show his countrymen that sculpture was a living art, that it could properly express the things that are, as well as the things that were; that a subject was not too humble to be treated by the artist, because it entered into the daily life of his

COMING TO THE PARSON.
John Rogers, Sculptor.

own people. Rogers plainly blazed the way for stronger, better trained but less original men, and with it all he had no mean share in feeding the fires of patriotism through the four long years of civil war.

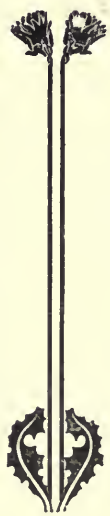
His recognition was instantaneous. Rogers was the people's sculptor. He told the story of his time in clay just as sincerely as the men of Barbizon told theirs in color. His public was crude and his efforts are not to be compared with theirs, but within his limitations he served his purpose with as much sincerity and with equal effect. Our national art and our national sentiment both owe a debt to John Rogers.

Charles Henry Israels.

"TWILIGHT."

Cast in Bronze by John Williams. Olin Warner, Sculptor.

EXAMPLES OF RECENT
BRONZE WORK



"THE APPROACH OF THE WHITE MAN TO THE PACIFIC COAST."
Erected in Portland, Oregon.
Cast in Bronze by Bureau Bros. H. A. MacNeil, Sculptor.

BRONZE ELECTROLIERS—18 FEET HIGH.

Oliver Building, Pittsburgh, Pa.

Cast by Union Equipment and Bronze Co. D. H. Burnham & Co., Architects.

"THE COLLEGE ATHLETE."

Cast in Bronze by John Williams. R. Tait McKenzie, Sculptor

BRONZE ELECTRIC FIXTURE.

Cast by the Horn & Brannen Manufacturing Co.

THE "NEW LIFE."

The Bonney Memorial in Lowell Cemetery.

Sculptor, F. Edwin Elwell; Cast by Bureau Bros. Henry Bacon, Architect.

"INDIAN IN CANOE."

Cast in Bronze by John Williams. John Francis Brines, Sculptor.

WROUGHT-IRON ELECTRO-BRONZE PLATED BRACKETS, U. S. MINT, PHILADELPHIA.

Cast by John L. Gaumer Co.

THE GREATEST OF BUILDING PROBLEMS—ITS SOLUTION.

[*The following is the first of a series of Technical-Industrial Reports upon a certain System of Fireproofing, made to the Manufacturers by the well-known expert on Building Construction, Mr. William J. Fryer.*]

The Problem

The proper construction for a fireproof building has received the closest attention of some of the brightest minds in this country for a number of years past. Whether such a building is designed to have solid brick walls, or a steel skeleton frame supporting thereon the walls and floors, or a cage construction where the exterior walls are independent of the interior columns and girders which support the floors, there now remains practically nothing that is not known and recognized as necessary to be done in providing safely for the weight-carrying portions of the structure. Adequate encasement of columns, girders and beams from the weather and from the effects of fire and water, or the two latter combined; the avoidance of voids under floors and open communications between floors whether by elevators, pipe wells, floor lights, skylights, or furrings; fireproof partitions resting on wood floors instead of starting directly on the steel floor-beams or on the fireproof filling between the beams; insufficient protection for window and door openings against exposure hazards; the use of flammable trim and finish throughout the building; slate, marble or other stone treads on stairs when used without iron plate supports directly underneath—these and numerous other defects in construction have been revealed from time to time under the supreme test of fires in important buildings, and the repetition of bad features is being guarded against by compulsory measures incorporated in the building regulations of various cities.

The Wide Choice of Materials

For a fireproof building an architect has a wide range of materials—brick, terra-cotta and stone—to choose from in encasing the steel skeleton frame; and for the filling between the steel floor beams he has brick, terra-cotta and cement concrete. Each and all of these materials are good when properly applied, and the selection of one or the other, or of all, may be a mere matter of circumstance in any particular case. For partitions, elevator shafts and like enclosures, a decision as to the materials to be used is not extremely difficult. But when the question of the trim of the building, the doors, window frames and sash, the casings, and the walking surfaces of the floors, he is in a maze of doubt

and uncertainty as to what material should be used, having due regard to fireproof qualities, durability and appearance.

The Elimination of Wood

The lessons of the past have shown conclusively that wood must be eliminated from the list of materials to be used in the construction of a building that is to be considered fireproof. Partitions cannot be made fireproof with wood sash and doors in same; nor if bucks or frames of wood are used in their construction. Window frames and sashes of wood in the outer walls can no longer be offered as a temptation to fire from adjoining buildings. Wood floor surfaces are extremely dangerous, for in practice it is seldom that the concrete underneath extends up to the underside of the floor boards. Certain building laws authorize the use of wood covered with metal, and wood treated by fireproof processes. Wood covered tightly with metal soon becomes dozed, especially when exposed to the weather. Even doors and outside shutters, or what are called Underwriters' doors and shutters, constructed of two thicknesses of matched pine boards and covered with tin on both sides and edges, with folded lap joints, are subject to dry-rot and the wood is frequently found to be mere punk within a tin casing, particularly when exposed to the weather or where there is dampness within the building. Wood treated by so-called fireproof processes is for the most part an alluring sham. In a factory in the City of New York a lot of wood that had been treated "fireproof" elsewhere by one of the best, if not the very best, of the fireproof processes; and, at any rate, by a process acceptable to the Bureau of Buildings, was being worked up into shapes. A well-known builder standing by, asked of the manager of the factory: "What do you do with these shavings and short pieces?" The manager replied: "We burn them under our boiler!"

What To Use

What, then, is an architect to use for doors and windows and trim, and for floor surfaces and other purposes where wood has been so generally used? Is there a substitute that is scientific, practical, tested, adaptable, economical and financially guaranteed to be all that it is claimed to be? An affirmative answer is given to these questions, and the reader's attention and postal enquiry is directed to