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THE report of Judge French, Assistant Secretary of the Treasury, to whom were referred the accusations of the Collector and Assistant Attorney-general at Chicago concerning frauds in the stonework for the Custom House of that city, is a most reassuring document for everybody who was concerned in the administration of the work. It relegates the blame for the irregularities, which it admits as a necessary concomitant of the fifteen per cent contracts, to the workmen and time-keepers. The contracts, it says, were approved by the Secretaries of the Treasury who were in office when they were made, as well as by the Supervising Architect; they are responsible for them as well as he, and it is not worth while making investigations for the mere sake of throwing blame upon persons so long out of office. It is an unnecessary insult to former Secretaries to intimate that they made these contracts with fraudulent intent; and there is no evidence to show any actual fraud or misrepresentation on the part of Mueller, the contractor, or collusions with any person whatever. "If, in dealing with the officers of the Treasury Department," says the report, "he has otherwise gained any advantage," — that is, we suppose, if he has managed to outwit them, — "he is fully entitled to enjoy it." Judge French considers the contracts the most expensive means of getting government work done, but thinks they were made with the desire which leads private persons to have their work done by the day, — the desire to get the best possible quality of work. Of the contract for hauling stone, he says that it is "a valid legal contract," and the subordinate officers of the Government had no duty except to see that it was faithfully executed; and so the contract for sawing stone is declared to be a proper one, and there is no evidence of fraud in the administration of it. As for the quality of the stone furnished, the report recalls the fact that the opposing reports of the different commissions which examined it leave room for different opinions, and says, finally, "There is no doubt that Buena Vista stone is unfit for so large a building; but there is no evidence to show that the stone furnished was not the best the quarry offered."

THE Assistant Secretary admits that the cost of the attic was excessive, and that under a better system the work could have been done at half the price. He is probably justified in adding his conclusion that "no degree of diligence on the part of government officials above the rank of time-keepers could extort from laborers employed under fifteen per cent contracts anything like a fair day's work, such as they would perform when it is their interest to perform the greatest amount of labor rather than the least." Of the officials concerned he acquits the Supervising Architect, Mr. Hill, of all blame. Mr. Burling, who was the General Superintendent of the whole building, is not to be charged with fraudulent intent unless he assented to some fraud, and of this there is no proof; and as to Mr. Prussing, who was the superintendent of stone-cutting, and who declares that he knew of the want of faithfulness in the workmen, but was powerless to prevent it, there is no clear evidence of fraud on his part. It is evident, however, says the report, that the work-

men did by a common understanding delay their work, and the inference is almost irresistible that there was between the government time-keepers and the stone-cutters a combination, if not a conspiracy, to defraud the Government by prolonging the work. Finally, Secretary Sherman approves the report of the Assistant Secretary, with the comment that the chief cause of the excessive cost of the stonework is in the faulty principle of fifteen per cent contracts. He does not think that the superintendent, contractor, and chief subordinate were greatly at fault in the supervision of the work. The contractor under the fifteen per cent system he considers to have been as much in the employ of the Government and as much bound to protect its interest as if he had been salaried by it. The question of prosecuting any of the persons accused is referred to the Department of Justice. He nevertheless suggests that from the next fiscal year the superintendent and subordinate officers should be changed.

THE only respect in which the report seems to suggest criticism is its apparent desire to put the best possible face on the whole matter. Making due allowance for this, its general view of the situation seems to be a judicial one. We have not to consider what control might have been exercised by exceptional sagacity or efficiency on the part of the officials. The working of the system has been deplorable enough; but it was a matter of extreme difficulty to make it anything else. We have seen nowhere any evidence which throws blame upon the Supervising Architect. The worst thing that has appeared against the Superintendent and Assistant Superintendent was their neglect to protest energetically at head-quarters against the way the work was going, when they found it, as they acknowledged, impossible to resist it. This we would have expected them to do; and this, by their own showing, was the thing they did not do. As for the contractor, the Secretary, in his rather optimistic commentary, at least does not go so far as to commend him for the fidelity and care of the interests of the Government which he holds him bound to render; and we should be very much surprised to know that Mr. Mueller took the Secretary's view of his position, — still more, that he acted according to it. We have seen no evidence that he took any care of the interests of the Government, but there are evidences, as in the hauling contracts, that he was keenly alive to his own. As we have intimated before, the conditions of the contract seem almost to have removed from him the temptation to fraudulent action. With the rare advantage of the two hundred and fifty men, whom he was obliged to keep on the work, all actively interested in increasing his profit while they nursed their own, he could not have been more favorably placed to gather the fruits of unfair dealing without doing its dirty work. Under these circumstances only a depraved instinct would have led him to contrive frauds, when a simple policy of *laissez-faire* was just as profitable and more secure.

THE dispute between the city of Chicago and the county concerning the material of the Court House, of which the letters of our Chicago correspondent have spoken, has been decided in favor of the city. The county sued for an injunction to restrain the city from using the Bedford limestone because it was unlike the Lemont limestone, which the county had thus far used, on the ground of a contract which says that "the general exterior design of the building shall be of a uniform character and appearance," and the court has dismissed the suit. The judge's opinion, as we find it reported at length in the papers, does not seem to be convincing, being chiefly a general discussion of the proprieties of the case, without much heed of what would seem to be the main question, — whether two buildings, or two halves of a building, of stones which differ in color and aspect, can be said to have a design of a uniform character and appearance. The city thereupon proposes, it is said, to go on at once with its half in the Bedford stone, but the county commission threatens an appeal to the higher courts. The commission itself seems to be in a bad way. The people of the county voted last year against issuing bonds to meet the cost of the county building; and since the county treasury is empty, the warrants which the commissioners have issued to the contractors are dishonored, and after being sold for some time for what they will bring cannot now be sold at all.

THE sudden introduction in our large cities of innumerable elevators, most of which are hung by wire ropes, has led many people to wonder what will happen when they have had a few years' wear, and why there should not, after a while, be a general breaking of ropes, and consequent accidents all over the country. The hydraulic elevators with continuous or telescopic piston were secure against this danger, but on account of their cost, both in construction and in service, have gone into disuse, in this country at least, and rope elevators of one form or another have universally taken their place. Even where water-power is used it is applied in a detached cylinder and communicated to the car by ropes. The ropes are made of iron or steel wire, as the material least liable to wear; and the question of the endurance of wire ropes, therefore, becomes a very important one. It is a part of the question, still unsettled, of the permanent behavior of iron under continued stress. There are those who to this day fight against the doctrine, which nevertheless seems abundantly proved, that continual vibration ultimately changes the structure of iron from fibrous to crystalline, and so weakens it. It is clear that under favorable circumstances this action may be extremely slow, as in the case of piano wires, which may endure a generation of hammering under great tension. In the case of such comparatively unpliant structures as wire bridges, though they are probably doomed to give way before they are worn out unless they are renewed in season, there is time as well as inducement to guard against the danger by repeated tests. But everybody knows at least that reiterated bending weakens wire, whether it be by granulation or by the constant extension of its fibres; yet in the case of elevators, which are needed for constant use, the temptation will be strong to keep them going till the ropes give way, unless some obvious deterioration gives warning; there is, therefore, room for serious apprehension as to what may happen by-and-by. A late accident in Chicago, wherein life was lost by the breaking of an elevator rope, has led some one to print in the *Chicago Tribune* letters on the subject from the Messrs. Roebling, the designers and builders of the East River Bridge, and others. After saying that wire ropes from frequent passing over pulleys become granulated and worthless, without showing visible deterioration, they give the important but neglected caution that "large drums, sheaves, and pulleys are absolutely necessary for the long life of a wire rope," a matter in which, they say, the best elevator builders are apt to be interfered with for want of room. Cast-steel ropes, they add, require very large drums, and those of Bessemer steel are almost worthless. They think that the ropes on passenger elevators ought for safety to be changed every two years.

In regard to the East River Bridge it is said that the decision of the Trustees to use it for trains of the ordinary four feet eight and a half inch gauge was in direct opposition to the advice of Mr. Roebling, their engineer. This is a responsibility which, it seems to us, no inexpert board has a right to assume in a matter that involves danger to life and limb. It is too much of a piece with the action of the late president of the Lake Shore Railroad, when he defied the advice of his engineer, and had the Ashtabula bridge constructed according to his own notions. Mr. Roebling's opinion was that the vibration of the bridge under violent winds would make it dangerous to cross it with trains of the ordinary gauge, and that trains of six feet gauge would be too heavy for it. Under these circumstances, if the use of the bridge for steam trains is considered vital, as we suppose it is, the suggestion which has been made is reasonable, — that the engineer should be invited to consult with a committee of his professional brothers. If a number of his fellows whose judgment commanded his respect should fail to agree with him, an engineer or an architect may be fairly expected to waive his opinion; but for an ordinary committee (which from a professional point of view is an ignorant one) to override his opinion on a question of safety is to assume an utterly unwarrantable risk. We must say, by the way, that it seems rather a narrow chance to run a train of the common gauge over a bridge that is not thought strong enough for one of six feet gauge.

We suppose it will be many years before it is decisively proved that the works of Captain Eads have been successful, although if they are to be a positive failure the proof of it may be expected to be made evident much sooner. It seems certain that the work thus far done is successful and has justified the action of Congress. If, as is stated, a new bar is not form-

ing just beyond the jetties, it is probably owing to the action of an ocean current which, running westerly, sweeps under the out-flowing river water and prevents the immediate deposit of the sand and mud contained in it. The success of the undertaking seems to be dependent on the strength of this westerly under-current, for unless it is sufficiently strong to drive the muddy water, diluting it in passage with its own water, so far from the mouth that the sediment must be deposited over a wide area, it will probably only lodge it on the western side of the jetties and make it necessary to extend their line from time to time. The jetties have been subjected to severe criticism by General Humphreys, Chief of U. S. Engineers, who has never believed in them, and has, as Captain Eads shows in a letter called out by a recent pamphlet by General Humphreys on the subject, done all that he could to nullify by official obstructiveness the working of the Jetty Act as passed by Congress. Captain Eads states that the act was framed with the special purpose of excluding General Humphreys from any control of the work, and that it contained these words: "Said Eads shall be untrammelled in the exercise of his judgment and skill in the location, design, and construction of such jetties and auxiliary works." Yet, although it was provided that reports should be made directly to the Secretary of War, General Humphreys directed that the inspecting officers should report to him, and so during one year obtained information in regard to the works which he utilized by incorporating in memoranda which he from time to time published in opposition to the undertaking. A successful appeal was at length made to the Secretary of War which put an end to this seemingly unjustifiable infringement of the Jetty Act, which so explicitly declares that Captain Eads shall be "untrammelled."

THERE is, we know not its origin or age, a superstition that it is unlucky to build in marble. The temples of the Greeks and Romans clearly show that the belief is of less age than themselves, and it is probable that it gathered form during the Dark Ages. Buildings built in these times are so few, and their history and chronology so open to doubt, that it cannot be determined whether in the little building that was done marble was or was not used. Whether superstition had anything to do with it or not, few buildings during the succeeding Middle Ages were built of marble, and of these few the Cathedral of Milan is easily the most important. But we question if the pious Jean Galeaz, had he known the blight that was to fall upon his gift, would have bequeathed his marble quarries to the architects of the Cathedral; of which bequest one of his descendants reproachfully said, "He gave enough marble out of which to carve a thousand statues, but they would insist upon building a church with it." If the Cathedral had been built of stone from this quarry only, it might be suggested that the pious Galeaz had attempted to ease his path through purgatory by a gift that was little costly to his heirs. Be this as it may, the curse that hangs over marble buildings has fallen on this most magnificent of Italian Gothic — Arab-German we are told it should be called — cathedrals, and is causing it to decay and crumble away beyond possibility of check or satisfactory restoration. A recent professional report upon the cathedral states that the whole building is affected by the peculiar atmosphere of the country, which is honey-combing the surface right and left, so that it has the appearance of being attacked by some eruptive disease, which affects the stone coming from different quarries in as many different ways. All this is going on above ground, while water and dampness have so affected the lower walls that the building rests on very insecure foundations. Now that attention has been drawn to this corroding action of the air, — it had before this escaped the notice of all conservators of the building, who contented themselves with making specific repairs when necessary, — a careful inspection of the building shows a most disheartening condition of things. Statues, pinnacles, spires, carving, even monolithic columns surely, if slowly, are crumbling and disappearing; even bronze work, gold, and crystals are said to be affected by the climate.

THE royal report on the building is, says the *Building News*, "far from being a Blue or Yellow Book of the ordinary character." It is carefully illustrated with drawings and photographs of the dilapidated portion, and offers visible proof that its statements are not foundationless, but that this famous building, begun in 1387, or thereabouts, and still incomplete, though, as at Cologne, repairing old parts and building new go on side by side,

this building which so impressed Napoleon Bonaparte that he spent many millions of francs in continuing the work, is in danger, if not of actual material destruction, at least of irreparable artistic injury. Search is making for marble that is able to resist the climatic influences at work, but it has hitherto been unsuccessful, and it is only too probable that the course that will be followed is to tool over the whole building, inside and out, scraping the walls to a dazzling whiteness, and recutting mouldings, carvings, and statues, destroying in so doing all the original sharpness and delicacy of the cutting, and leaving in their places either rounded and debased forms or lines wrongly sharp and features unduly accented. It is not impossible that the scraping and cleaning of the Cathedral at Florence, to which we called attention some time ago (*American Architect*, No. 116), may have been rendered necessary by a similar perishing of the marble. If the Cathedral is by any processes of repair or restoration to be endued with a Parisian newness, it is to be hoped that the plan approved by Bonaparte, of removing from its vicinity the squalid buildings which cluster about it, may be carried out. Of late years an English company has done something toward improving the surroundings of the Cathedral, and the Galleria Vittorio Emanuele, designed by the late Signor Mengoni, is the first feature of their scheme that has been carried to completion.

BYZANTINE ART AND THE CESNOLA COLLECTION.

THOUGH the treasures of the Cesnola Collection may appeal more strongly to men of other crafts, it has, nevertheless, points of special interest for the architect which have not as yet been satisfactorily dwelt upon. One such point is the testimony it may give as to the origin of what are known to us as Byzantine types of decoration.

It will scarcely be claimed by any student of the history of art that the antecedents and predetermining causes of the Byzantine style, as it arose in the East to be ingrafted on the Romanesque architecture of the West, have ever been thoroughly investigated and clearly set forth. All writers agree that it was the product of Greek artists, accustomed to the use of Roman constructive forms, and, it is vaguely added, subjected to Oriental influences. All that is new and strange, all that is not distinctly and indisputably classic, is laid to this Oriental influence; but what that influence was, by whom exerted, why so readily received, and how so wonderfully elaborated are questions that have never been authoritatively answered, that are rarely even stated.

Now "Oriental" is at best a vague, amateurish word, which should never be used in technical treatises unresolved into its possible elements, — Persian, Hindu, Chinese, or other, as the case may be. However it is in literature, or philosophy, or ethics, in art at least there is no universal style that can be called "Oriental," unless we use the word style so loosely as to find its equivalent in the subtle coloring which belongs alike to all branches of Eastern art. Furthermore, if some claim that an indistinct idea *does* exist in most minds when they read of an "Oriental style," yet such an idea would by no means correctly typify the influence that worked to produce Byzantine forms. We could not call the strange new influence Persian or Indian or Chinese, nor is it allowable to jumble up our ideas of all these and with equal vagueness and falsity to call it "Oriental."

If we turn, however, from many examples of misapprehension and neglect and look for a really suggestive inquiry into the origin of the style, we shall find one such in the pages of M. Viollet-le-Duc's "Discourses on Architecture." It is truly but brief and sketchy, yet it may in the future supply the text for more radical investigations, and even in its present shape it is provocative of discussion. M. Viollet-le-Duc, basing his arguments on the ideas, sketches, and photographs brought from Jerusalem by M. de Saulcy, gives us in a few pages his reasons for believing Byzantine architecture to be a blending of Greek and Semitic art forms, with the retention of many Roman modes of instruction.

A characteristic Semitic art in any shape will seem a strange thing to many, so familiar are we with Mr. Fergusson's dogmatizing on the subject. Among other theories, artistic and ethnographic, which, though sometimes conceived with prejudiced eyes, Mr. Fergusson yet follows out relentlessly, we find one to the effect that no Semitic people has any art instinct or has ever produced original works of art. He contradicts this theory, it is true, by one little phrase which notes the "Jewish vines and foliage" of the *Gate Huldah* as the saving element in its somewhat chaotic decoration. But by no word does he credit this Jewish work with any influence on the style of subsequent centuries.

I have not space to trace the arguments which M. Viollet-le-Duc (in his easily accessible volume) uses to support his assertions that parts of the substructure of the Temple at Jerusalem, including the remains of an arch which sprang from it, date back to the Phœnicio-Judaic epoch; that the tombs in the Valley of Jehoshaphat are the tombs of the kings to whom their popular nomenclature attributes them; that the fragment of an arch (figured in his pages) is of Herod's time and the *Golden Gate* contemporary with it, and that the

details of all these are neither Greek, Assyrian, Egyptian, nor Roman. Many writers dispute such chronology. M. de Vogüé,¹ for example, gives to Solomon nothing but the (destroyed) east side. The mighty foundations are all ascribed to Herod, while the *Golden Gate* and the other decorative works fall to the credit of Justinian and the sixth century. There is no historical record to go by; style is our only help in deciding between the so opposite views of such noted critics.² The reproductions of the decorative work seem to speak for M. de Saulcy, and even if this work be as late as M. de Vogüé puts it, yet "native artists, with traditions of their own," must have been employed, for outside of the eastern portion of the empire, as M. Viollet-le-Duc goes on to say, there is no Roman work to be found which at all resembles it, showing as it does "a dry, precise, flat, but sharply cut method of execution, a primitive touch of the chisel, qualities alien to those of the sculpture of the Lower Empire, which is soft, clumsy, of high relief and great monotony of treatment." Though these fragments have been made the turning-point of the whole dispute, it is their position that has alone made them so exclusively prominent. Even if they fail M. Viollet-le-Duc, his theory by no means falls to the ground. There is still plenty of evidence to carry the style of work under consideration back at least to Herod's time. The pages of M. de Vogüé's own works and of Texier³ give ample proof that in the lands they describe an art existed, as far back as the first Christian centuries, which is truly and distinctively Byzantine. We have no other word for it, though the time was far distant when Byzantium should pose as the birthplace of the new child of art. St. Sophia (A. D. 537), which has so often been considered almost the first-born of the style, was merely the culmination of a progress both long and slow. The first dome with pendentives, for instance, whose date we know, is found in Southern Syria, and is of the year 282 of our era. The Greek architects, who had been powerless to stop the rapid fall of art in the West between Augustus and Constantine, were, between Constantine and Justinian, developing in the East, where they were less fettered by the iron requisitions and love of precedent of their Roman masters, a new style of architecture. But when we see how different this style became from anything that had gone before, we find it hard to believe that it sprang unmotivated from the brains of men who had seen nothing but the decorative works of Athens and of Rome. M. Viollet-le-Duc, in speaking of this rise of Byzantine art, claims it to have been a *rise* in the fullest sense of the term, a Renaissance of Greek art in new shapes, not a demoralizing nor a barbarizing of Roman art, as is so often said. M. Texier, on the contrary, takes occasion to show his lack of appreciation of the service he has himself in his explorations rendered to the history of art, when he speaks of some Salonican capitals as "giving in their *à-four* work," like some in the pre-Justinian church of Sts. Sergius and Bacchus at Constantinople, "the only symptom of *declining* art." This of one of the beautiful Byzantine types that were growing out of the contemptible Roman art of Constantine!

M. Viollet-le-Duc says further, that no revival can come from decay alone. Such decay as this of Roman art could not by itself have given birth to the new and living freshness of Byzantine forms. Where are we to find the source of the new blood that must have been infused? How, even if we go back from Justinian to Herod, if at the same time we claim for Palestine and Asia Minor and Syria and Thrace that their building was done by Greek and Roman architects who had studied no otherwhere than in the classic schools? Five centuries of retraced steps do not solve the problem, if we find in all of them no outside influences coloring the main stream of classic art. Looking for such outside influences, Assyria and Egypt fail us. The Parthian remains,⁴ which are decorated partly in this "Byzantine" style, are not much earlier than the Christian epoch, and the only Persian works which show analogous types are of the Sassanid dynasty and probably the sixth century A. D. All of these show merely the same thing we have seen nearer the Mediterranean, — show the unnamed influence acting upon classic traditions. We seem to find ourselves obliged to accept, as a "working hypothesis," M. Viollet-le-Duc's assumptions as to the Phœnician origin of the style, and to cast about in search of further facts than he adduces to support or to refute these assumptions.

Passing by many published sources which give hints of nothing more as to the recurrence of the types we seek in remains indisputably Phœnician, I wish here to notice myself the testimony of the Cypriote collection in the Metropolitan Museum. The Phœnician work, which by all critics is allowed to be very distinct from the work of Greek, Egyptian, or Assyrian, has been often discussed in relation to the probable influence of Phœnician on early Greek art. This is a separate and distinct question, the solution of which has been differently found by different writers. Our idea is another, — that there was a native Semitic art existing in the Phœnicio-Judaic epoch, and that this art subsisted through many centuries, not in Greek developments, but on a meek and inconspicuous side-line of its own, to become the consecrate style of the early Eastern church, to blaze perfected in St. Sophia, and to be found in identical decora-

¹ Syrie Centrale. Églises de la Terre Sainte.

² The question is argued by M. de Saulcy and M. de Vogüé through various volumes of the *Revue Archéologique*.

³ Byzantine Architecture.

⁴ See Loftus's Travels.

tive shapes throughout the Romanesque of Western Europe, but especially of Germany, as lying nearest to the East.

Certain engravings in General di Cesnola's book¹ seemed, in reproducing objects of great antiquity, to show the well-known type of decoration, and an examination, with an eye to its recurrence, of the collection itself yields far more striking evidence for the truth of M. Viollet-le-Duc's assumptions than one could even have hoped for. Statues, metal-work, vases, lamps, all give more or less distinct witness in his favor.

What is the type for which we look? We can, perhaps, have no clearer description, as far as it goes, of true Byzantine ornament than is given in Owen Jones's "Grammar of Ornament" by Mr. Waring, when he says it is "distinguished by broad-toothed and acute-pointed leaves, which in sculptured work are bevelled at the edges, are deeply channelled throughout, and are drilled at the several springings of the teeth with deep holes. The running foliage is generally thin and continuous. . . . Thin interlacing patterns are preferred to geometrical designs." "Leaf within leaf," says the same volume, treating of the classic acanthus, was the system of Greek and Roman decoration, and was elaborated even to excess by the Romans. "Not until this system was abandoned for a continuous stem, throwing off leaves on either side, was there progress in decorative art." This is as far, however, as we can follow this volume, for it then cites St. Sophia as the first example of this sort of design. At Persepolis, — in the Sassanid remains, — we find "pointed and channelled leaves, and stems without the ball and leaf." These formulas define pretty well what we are to look for, if we note in addition that the interlaced and geometrical Byzantine patterns are very different from the "arabesques" that were later to grow out of them; that in the sculpture the relief is low and the effect flat, and that there are certain favorite and oft-repeated motives that have no exact counterparts in Grecian art, such as pecking-birds, the "St. Andrew's cross with foliated ends contained in a circle,"² bunches of grapes with or without their leaves, various zig-zag patterns, and the so universal beadings or strings of pearls.

Looking for these things first in the Cypriote statuary, we find many heads and figures that are unmistakably Assyrian or after Assyrian models, for in addition to other evidences they have the flower-like ornament so profusely used in Assyrian art, the ornament that in modern work is called a "marguerite." Other figures, also un-Greek in type, have wreaths of fine foliage. One, No. 220, with olive-like leaves, is very primitive, yet one sees that it is not the archaism of Greece. Another, a female figure, bears a branch of similar foliage, which, in the designing and workmanship of its channelled leaves, resembles most closely some little cuts given by M. Viollet-le-Duc as foliage from the tombs in the Valley of Jehoshaphat. In no case does this foliage occur in conjunction with the Assyrian marguerite, as it presumably would do if it also were a primitive Assyrian motive.

The pottery collection is in such confusion — perhaps as yet unavoidable — that one has only one's own judgment to rely upon for dates and nationalities. But it is comparatively easy, even for a non-expert in ceramics, to find the typical Greek work, and Egyptian influence is always easily marked. Assyrian is less distinct, perhaps, yet we can trace it and credit it, for example, with the marguerite, when it occurs, and with patterns resembling the famous sacred tree. What remains must be in great part Phœnician. Incised hatching and concentric scrolls are two features which General di Cesnola and others claim as primitive Phœnician, and on examination we find, in connection with these, patterns less primitive and of the exact type we seek. There is a little peculiarly shaped black lamp, with hatched squares surrounded by beading and alternating with scrolls. Other lamps have oak-leaf wreaths with continuous stems crossed at the butts; others, oak branches, natural in treatment; another, sinuous grape-stems with leaves; another, a dove bearing a branch with pointed and channelled leaves, — all utterly un-Greek in treatment. Further, there are some lamps of ungraceful design, but exquisite workmanship (one is figured in Isaac Hall's "Cypriote Inscriptions"), with a herring-bone pattern encircling them, and vine wreaths, some with grapes in bunches, and some with a sort of forget-me-not flower. Nothing could be more like early Romanesque work.

The metal-work affords the most valuable part of our evidence. The patterns and styles in the gold articles are many, but there are few of the many that do not find their counterpart in the metal and stone decoration of Byzantium. Would you see a "St. Andrew's cross with foliated ends contained in a circle"? Look at the perfect Romanesque pattern repeated on each of the numerous thin gold plates, about an inch and a quarter in diameter, that went to form the mortuary necklace of a Phœnicio-Cypriote king of earliest days. And look from it to the gold cross of Charlemagne's time, shown in the Castellani collection, or compare it with the cross-shaped designs in Owen Jones's Byzantine and Romanesque pages. The resemblance amounts to identity of style. Then we find a gold ring, its pattern having been originally filled in with enamel, with beaded edges, which is but a sample of many similar articles that are duplicated in Byzantine jewelry. A reliquary of this latter style, for example, is depicted in the little South Kensington pamphlet on

"Enamels." The crucifix is, of course, a new element, but the decorative parts proper might have been designed in Cyprus.

The curious sarcophagus, the lid of which is engraved on page 267 of "Cyprus," is not exhibited in the museum, and the engravings are sometimes so inaccurate that we can hardly trust to this one to give us the exact value of the original. The *stelæ*, at page 117, are certainly suggestive of later work, — perhaps of the Byzantine block above the capital.

One more fragment of presumptive evidence as to the connection of primitive Semitic art with the pre-Byzantine forms of the early Christian centuries: In De Vogüé's "Central Syria" I had noticed some time ago certain peculiar forms of architectural decoration. Broad, deeply channelled, but plain mouldings frame the top and sides of the windows, and continue across at the bottom from one window to another. Similar mouldings encircle the doors, and at the ends of each row of windows and the bottom of the door-jambs, the lines curl outward, returning to meet their own perpendicular lines in a sort of volute. The effect is very unfortunate, especially on the larger scale applied to the doors, for the framework of the apertures appears to rest on these soft, curled-up volutes. It can only have been a decorative motive applied thus semi-constructively by hands that were feeling about in the uncertainties of a growing style. Believing this, I noted it for future comparison. The identical pattern I afterwards found to exist in color on many of the early Phœnicio-Cypriote vases.

It is useless to multiply references, for without illustrations the assertion that a dozen examples exist is no more convincing than the claim to one. Only, if it be allowed that in General di Cesnola's pages there are shown at least the traces of such a style as we have been seeking, I can safely affirm that an examination of the collection itself will discover such traces in a hundred-fold greater abundance and clearness.

M. G. V. R.

THE ILLUSTRATIONS.

THE BISHOP CUMMINGS MEMORIAL CHURCH, BALTIMORE, MD.
MR. CHARLES E. CASSELL, ARCHITECT.

This church is now being built on a very good site, corner of Carrollton Avenue and Lanvale Street, facing La Fayette Square. The exterior walls are to be of blue gneiss relieved with red and yellow sandstone, the shafts of columns being of polished red granite. The intention is to face the interior of the walls with bricks, with caps, corbels, and mouldings of sandstone.

STUDY IN PERSPECTIVE. — PLATES X. AND XI.

See "Paper on Perspectives," in this number.

DWELLING HOUSE IN NEW YORK. MR. R. M. HUNT, ARCHITECT.

This house is, we believe, situated on Thirty-eighth Street.

PAPERS ON PERSPECTIVE.

XI. THE PERSPECTIVE OF CIRCLES.

In the ten preceding papers we have considered all the principal problems of plane perspective embraced in our scheme. That is to say, we have shown how to obtain, upon a plane surface, the perspective representation of a straight line; whatever the position of the surface, and whatever the position of the spectator, we have shown how to obtain the position, magnitude, and direction of the representation of a line, when the position, magnitude, and direction of the line itself are known. The problems of shadows and of reflections have also been fully discussed, so far as concerns plane surfaces. Throughout the whole investigation it has been shown that the problem of the line includes the problems of plane and solid figures and of the point. In every case the vanishing point of every line and the vanishing trace of every plane has been ascertained, the solution being considered incomplete until this was accomplished.

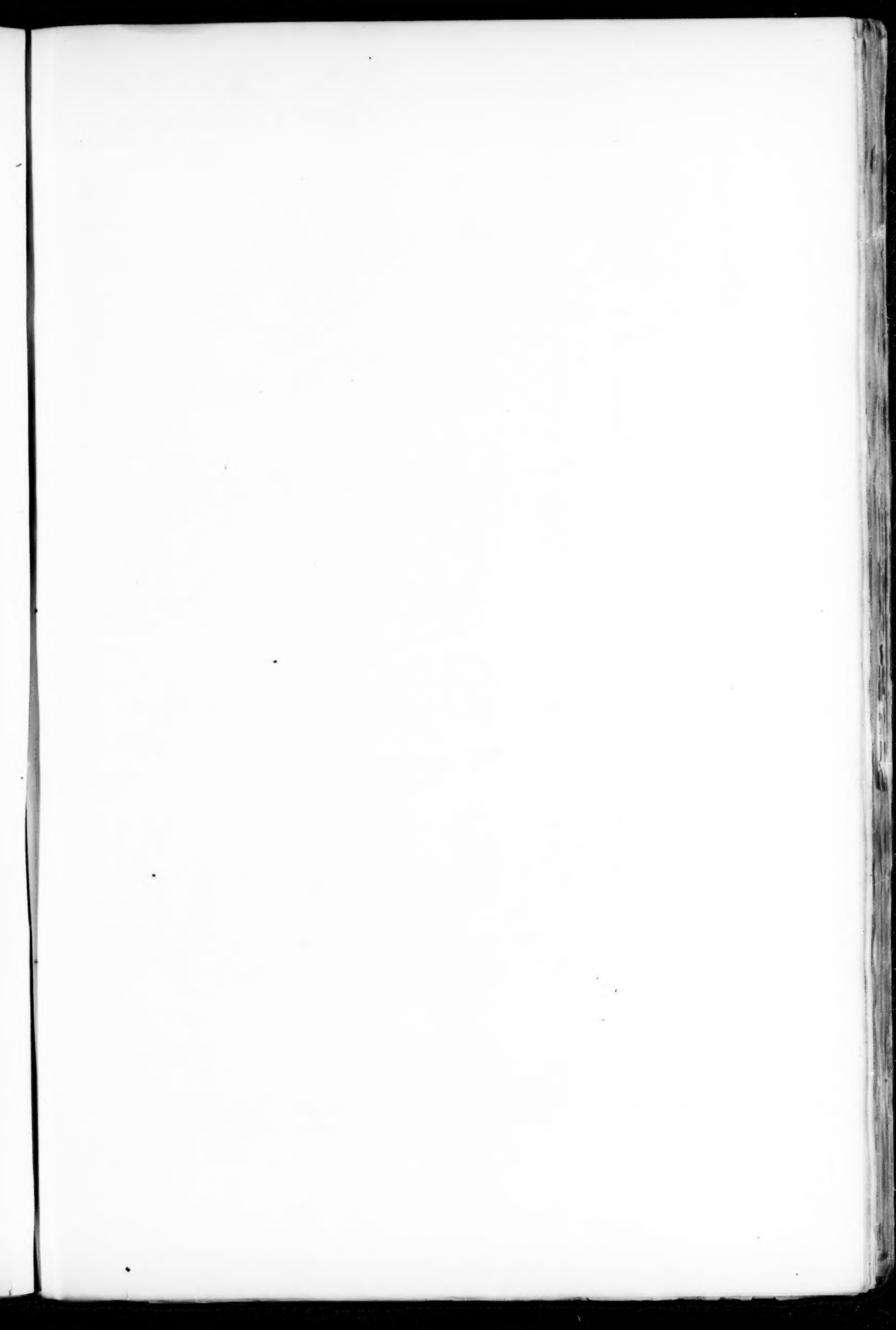
219. The only lines included in this survey have accordingly been right lines, and the only plane or solid figures have been such as are bounded by right lines. Any other line or outline in perspective, as elsewhere in geometry, must in general be treated as a series of points, the perspective representation of each point being obtained separately. But to this rule the circle, here as elsewhere, constitutes an exception, its exceptional importance making it worth while to give it special consideration, while its peculiar geometrical properties render the investigation exceptionally simple and easy.

220. We shall find also that the study of the circle in perspective, and of its derivatives, the cylinder and the sphere, introduces a new set of most interesting phenomena, the investigation of which will, in a subsequent paper, lead to theoretical and practical conclusions of the first importance.

221. The perspective representation of a circle will obviously be the line in which the plane of the picture intersects a cone of rays of which the vertex is in the eye of the spectator, at the station point, and the base is the circle itself. The theory of conic sections establishes the fact that this line of intersection will be a circle, ellipse, parabola, or hyperbola, according to the angle at which the plane of the picture cuts the cone of the rays, and this whether the

¹ Cyprus: its Cities, Tombs, and Temples.

² Grammar of Ornament.





— DWELLING HOUSE IN NEW YORK — M^R M. HUNT, ARCHT. —

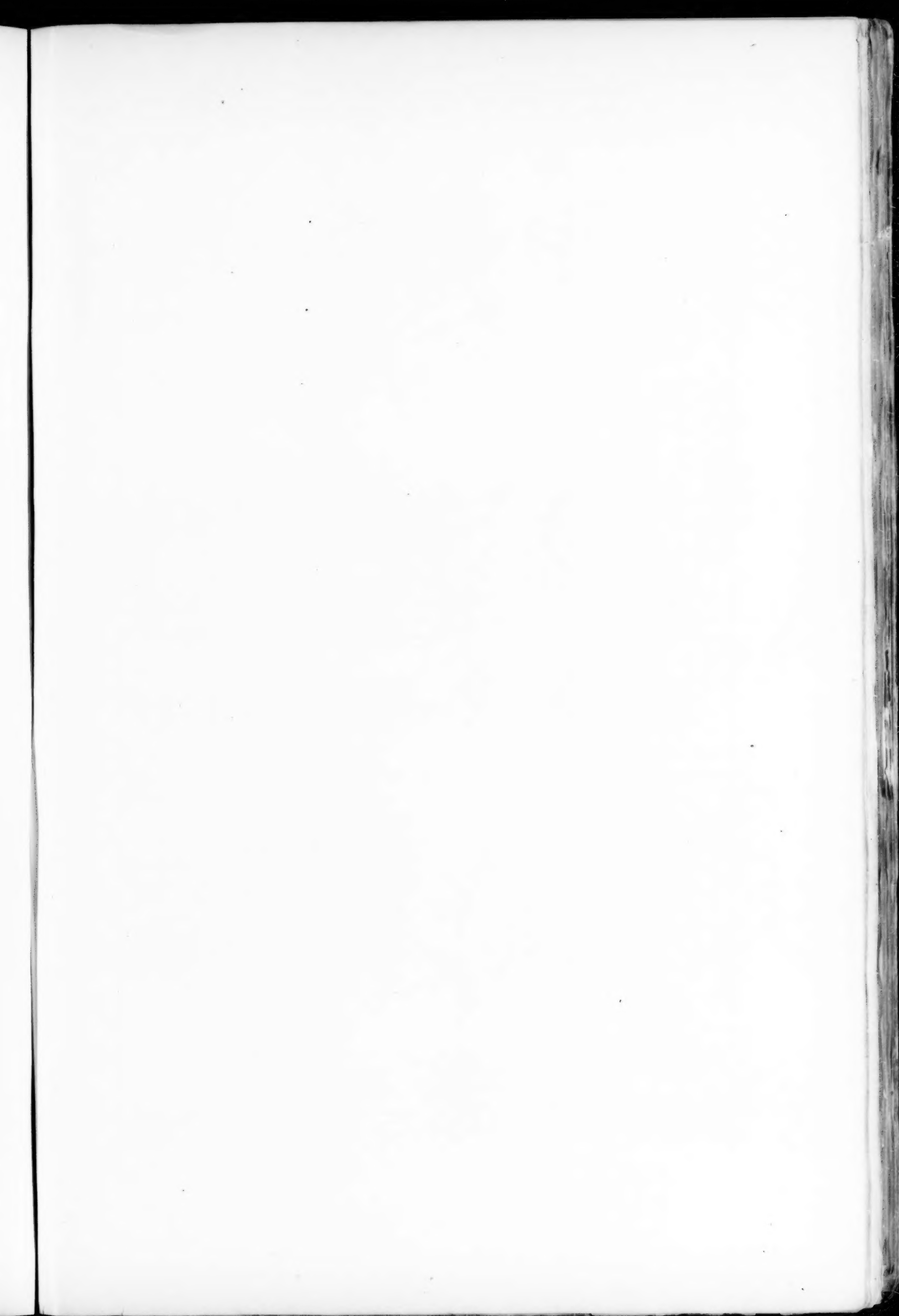
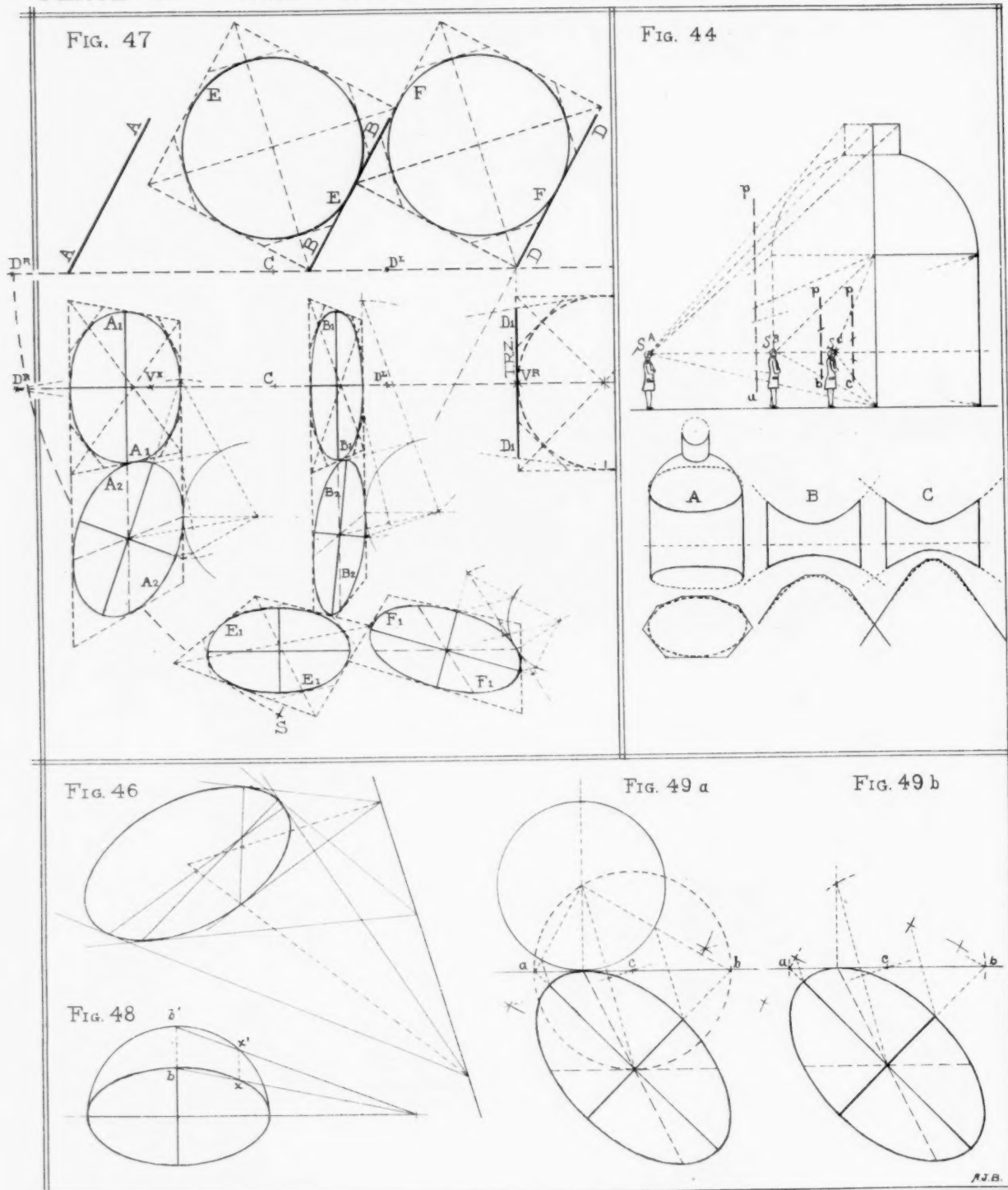
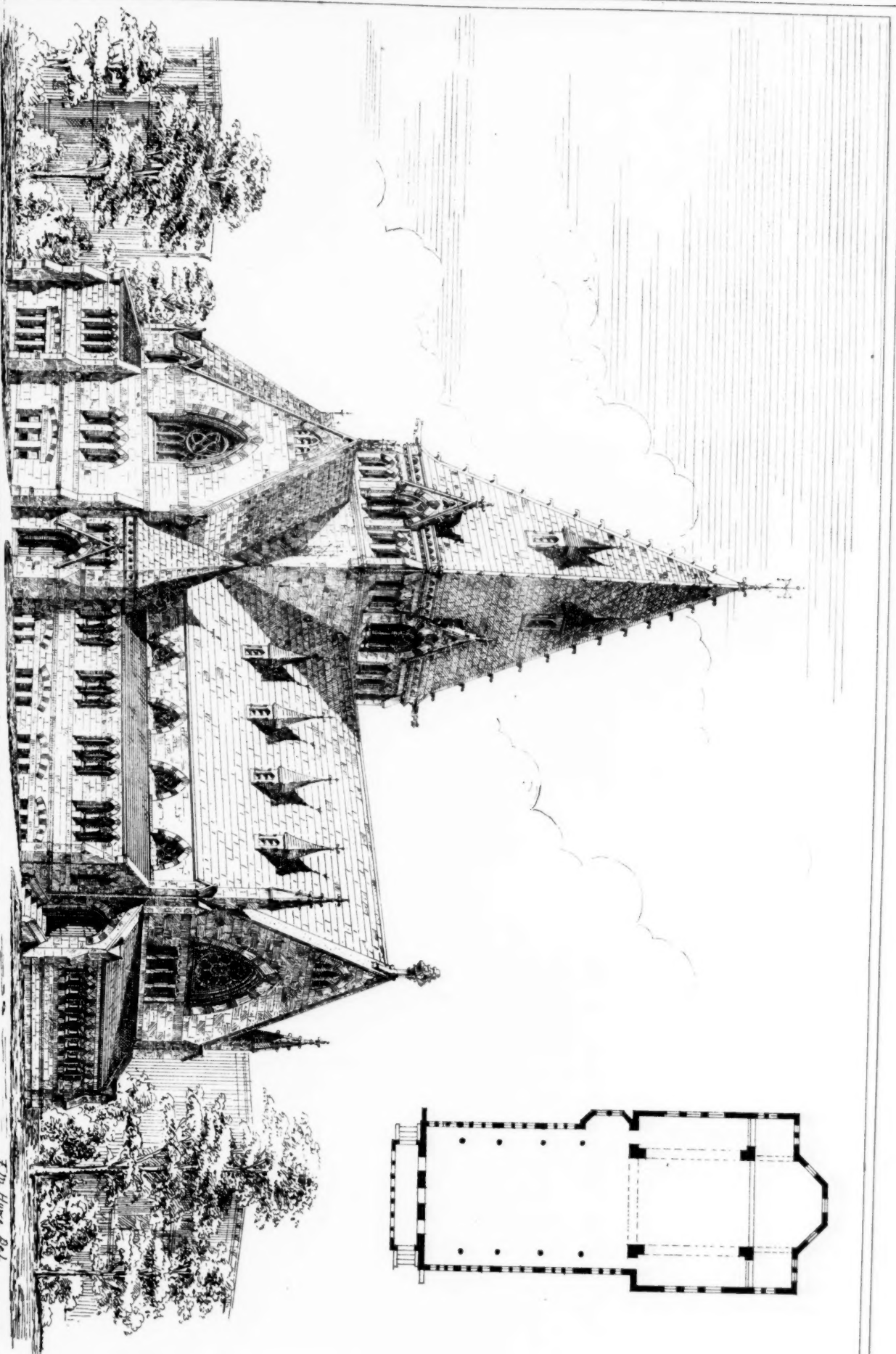


PLATE X. THE PERSPECTIVE OF CIRCLES.





THE BISHOP CUMMINGS MEMORIAL CHURCH BALTO. MD.

CHAS. F. CASSELL, ARCHT. T.

axis of the cone be at right angles to the circle or inclined to it. In other words, the cross-section of the cone perpendicular to its axis may be either a circle or an ellipse. If the second plane is parallel to the base, or equally inclined to the axis in a contrary direction, making what is called a *sub-contrary* section, the perspective will be similar in shape, though not of course in size, to its original.

222. This is illustrated in Figs. 44 and 45, Plate X., and also by the two figures 50 and 51, in Plate XI., all of which show how horizontal circles, whether below or above the eye, will appear when viewed from different positions.

In Fig. 44 the spectator is shown as regarding the circular room on the right from three different positions. At S^a he is outside the room; the plane of the picture pa cuts completely across the cones of rays, and the sections are ellipses, as shown at A, below. At S^b he is just upon the edge of the circle; the plane of the picture pb cuts the cones in a direction parallel to one side, and the sections are parabolas, as seen below at B. At S^c the spectator is fairly within the circle, and the intersection of the vertical plane pc with the cones of rays gives hyperbolas, as at C. Figs. 45, 50, and 51, which are reproductions of some old engravings of circular halls in the Vatican Palace, excellently illustrate these elliptical, parabolic, and hyperbolic lines: the first being drawn, presumably with a *camera lucida*, from a point outside the circle; the second, from a point just on the edge of the room; the third, from a point within it.

223. Fig. 44 also illustrates the case in which the cone of rays is intersected by the plane of the picture in such a way as to give a sub-contrary section. The small horizontal circle forming the eye of the dome is the base of a cone of rays which is cut by the plane ap , at an angle with the axis of the cone equal to that made by the circle itself, but taken in a contrary direction. Both are obviously angles of 45° . The perspective of the circle is accordingly a circle (221), as is shown below. In Fig. 45, also, the perspective of the circle at the top of the dome is almost exactly circular.

224. In general, of course, the station point is outside the circle to be represented, so that practically the problem of putting a circle into perspective is this: to find the ellipse which represents it.

225. The simplest and generally the most efficient way to do this is to suppose a square or octagon to be circumscribed about the given circle, at any angle that may be most convenient. The centres of these sides give of course four or eight points of the required ellipse. As the direction of the sides gives the direction of the ellipse at these points, it can easily be drawn with sufficient accuracy for practical purposes. If greater accuracy is required the number of sides of the circumscribing polygon can be increased.

This is illustrated in Fig. 47.

226. But in order to draw an ellipse with precision it is necessary to find its centre, and the direction and length of its principal diameters or axes.

It is obvious from Figs. 44 and 45 that the perspective of the centre of a circle does not coincide with the middle point of the ellipse, as indeed it cannot, since the farther half of a circle must appear smaller than the nearer half, and its radii shorter. Neither do the extreme points of the ellipse represent the extreme points of the circle; the highest point in the perspective of an arch, for example, not being the perspective of the highest point in the arch, but of a lower point nearer the spectator. In fact, although a circle put into perspective appears as an ellipse, the diameters of the circle do not become diameters of the ellipse, but chords, which intersect at a point situated beyond the centre. On the other hand, the diameters of the ellipse, meeting and intersecting at its centre, are the perspectives of chords of the circle, which meet and intersect at a point within the circle nearer to the spectator than its centre, if the arch is above the eye, farther from him if it is below. The tangents at the extremities of each diameter of the circle are parallel; but their perspectives of course converge to a vanishing point; and since, for each circle, all these tangents lie in the same plane, these vanishing points all lie in the same straight line, which is the trace or horizon of that plane.

227. These phenomena afford a curious illustration of certain geometrical properties of the ellipse, which perhaps have no other illustration in nature. It has long been known to geometers that if a point be taken at random anywhere within a circle or an ellipse, and chords be drawn through that point, then the tangents drawn from the extremities of each chord will have their point of intersection upon a right line. This line is called a *polar line*, the point assumed being called a *pole*. As a mere geometrical proposition this seems to have no special significance; but the phenomena of perspective give it meaning. For a circle seen in perspective becomes an ellipse, its centre a pole, its diameters chords, and the polar line is the horizon upon which meet the tangents drawn from the extremities of its diameters.

228. Fig. 46 exhibits these relations, and illustrates also the further proposition, which, however, does not seem to admit of similar interpretation, that if lines are drawn from the points where the tangents meet through the middle of the chords they will pass through the centre of the ellipse. This property we shall find a use for presently.

Although in Fig. 44, A, the small vertical circle is the perspective of the small horizontal circle at the top of the dome, so that when seen from the station point S^a the two circles seem to coincide, yet

their centres do not coincide, and neither of them coincides with the axis of the cone. The centre of each circle appears as a pole of the other. If the cone be cut by a plane at right angles with its axis, the section will be an ellipse, of which the axis of the cone will give the centre, and of which the centre of the upper circle will be a pole situated just below the axis, and the centre of the lower circle will be another pole just above it.

229. It will be noticed in the figures already given, and also in Fig. 47, that the vertical circles whose centres are on the Horizon, and the horizontal circles whose centres are exactly above or below the centre of the picture, C, lie symmetrically on the paper; that is to say, their principal diameters, their major and minor axes, are vertical and horizontal, while other ellipses have their axes more or less inclined.

Another and more comprehensive statement of this phenomenon is this: that if a line drawn through the centre of a circle normal to its plane, like the axle of a wheel, passes through the centre of the picture, C, the principal axes of the ellipse that represents the circle will be parallel to and at right angles to this line. Other circles, which do not, as it were, *face* the centre C, will be projected in ellipses the direction of whose axes it is more difficult to determine.

Fig. 47 shows a number of circles, three of which, A A, B B, and D D, are vertical, and accordingly appear in plan as right lines, and two, E E and F F, are horizontal. These appear in perspective at $A^1 A^1$, $B^1 B^1$, $D^1 D^1$, $E^1 E^1$, and $F^1 F^1$, respectively. In all of these except the last, one of the principal axes passes through the centre C. In $F^1 F^1$, and also in the circles $A^2 A^2$ and $B^2 B^2$, the position of the principal axes is, so to speak, accidental.

230. Let us first take the case of the ellipses which represent circles that *do* face the centre C, and which accordingly lie symmetrically about a normal line joining this point with the perspective of their centres. This line will of course also pass through the centre of the ellipse, as in $A^1 A^1$, $B^1 B^1$, and $E^1 E^1$, Fig. 47.

231. If as in A A and B B two of the sides of the circumscribing square or octagon are parallel to the plane of the picture, and their perspectives consequently parallel to each other and perpendicular to the normal line, the line joining their middle points will be the minor axis of the ellipse; the major axis will cross it at its middle point, and it will only remain to ascertain the length of this major axis.

232. Fig. 47 shows how this is done. Let A A, B B, and D D, in the plan, be three parallel and similar circles, all touching the plane of the picture, and the last, as appears from the perspective below, standing edgewise to the spectator at S. If the space between them were filled up with other such circles they would all together constitute an elliptical cylinder, the apparent vertical dimension of which would be the apparent height of each of the circles and of the major axis of the ellipses that represent them. Now let the plane containing the circle D D and the station point S be revolved into the plane of the picture around the vertical line T R Z, in which the two planes intersect. S will of course fall at the point of distance D^2 ; the circle D D will appear of its true shape and size; lines drawn from D^2 tangent to the circle D D thus revolved will determine the highest and lowest points visible from S, and the points where these lines cut the line T R Z will show the perspective of these points on the plane of the picture, and fix the apparent height of D D. The circles B B and A A will appear to be of the same height as D D, and $D^1 D^1$ will be the length of the major axes of the ellipses that represent them.

233. When, as in the case of the circle E E, the tangent lines are not parallel to the picture, the square or octagon that encloses the circle being in angular perspective, instead of being in parallel perspective as in the previous instance, the centre of the ellipse must be obtained as above explained (228), by bisecting two of the chords, and drawing lines from the vanishing points of their tangents. The principal axes of the ellipse may then be drawn, one towards the centre C, and the other parallel to the picture, that is to say, parallel to the horizon of the plane in which the circle lies. The length of the latter, or major axis, may then be found by direct projection, as in the figure.

234. To find the length of the minor axis, the major axis and one point of the ellipse being given, it is only necessary to employ the usual device, shown in Fig. 48, founded upon the proposition that if a semicircle be erected on the major axis of an ellipse the distance of the different points of the ellipse from this axis will be proportional to that of the corresponding points of the semicircle. Thus in the figure, one point x being given on the ellipse, and x' and b' obtained on the circle, the point b at the extremity of the minor axis is easily found, since the chords bx and $b'x'$ meet on the line of the axis prolonged.

235. When the ellipse does not lie opposite the centre C, as is the case with $F^1 F^1$, and with $A^2 A^2$ and $B^2 B^2$, in Fig. 47, the normals drawn through the centres of these circles not passing across the centre of the picture (229), the only way to obtain the principal diameters or axes is first to obtain a pair of *conjugate* diameters. Conjugate diameters are diameters each of which is parallel to the tangents drawn through the extremities of the other. The axes are that pair of conjugate diameters which are at right angles with each

other; and one is always the longest diameter that can be drawn in a given ellipse, and the other the shortest.

236. The quickest way to obtain a pair of conjugate diameters in oblique ellipses such as $A^2 A^2$, $B^2 B^2$, and $F^1 F^1$ is to construct first such horizontal and vertical ellipses as $A^1 A^1$, $B^1 B^1$, and $E^1 E^1$, respectively, opposite the centre, and to obtain their principal axes as just described. If now the centre of each oblique ellipse is found, as above (228), and lines passed through it perspectively equal and parallel to these principal diameters, they will be conjugate diameters of the oblique ellipses. They will not be at right angles, but each will be parallel to the tangents drawn at the extremities of the other; one will be parallel to the plane of the picture and the other perpendicular to it, and directed to the centre C.

237. Fig. 47 also exhibits, in the case of $F^1 F^1$ and of $A^2 A^2$ and $B^2 B^2$, the geometrical operation by which, when an ellipse is given by two conjugate diameters, the principal axes may be obtained.

238. Fig. 49, *a*, shows this ingenious device more in detail. It is called the Method of Shadows, the ellipse being regarded as the shadow or projection of a circle. The process is this:—

A tangent being drawn at the extremity of one diameter parallel to its conjugate, a circle is erected also tangent at the same point, of such size that the ellipse might be its shadow. The shadow of every diameter of the circle will be a diameter of the ellipse, and the shadows of any two diameters of the circle which are at right angles with each other will be conjugate diameters of the ellipse, since the tangent at the extremity of one will be parallel to the other. The given conjugates of the ellipse are shadows of those diameters of the circle which are perpendicular to and parallel with the tangent line common to both circle and ellipse. Since the shadow of the diameter parallel to the tangent is also parallel to it, that line and its shadow are parallel to each other and must be of the same length. This fixes the size of the circle, the distance of whose centre from the end of one diameter is equal to half the length of its conjugate.

239. It now only remains to find in this circle a pair of diameters at right angles to each other whose shadows will also be at right angles. But since it is plain that if these diameters are prolonged till they reach the tangent line their shadows will also be prolonged, and will reach the tangent line at the same points, the problem becomes a very simple one. It is only necessary to find two points on the tangent line which make right-angled triangles both with the centre of the circle and with the centre of the ellipse; that is to say, two points such that the portion of the tangent lying between them shall be the common diameter of two semicircles passing respectively through these two centres. The common centre of these semicircles must be a point on the tangent line equidistant from the two centres; a point easily found by erecting a perpendicular upon the middle of the line connecting them, as is done in the figure. Semicircles struck from this point *c* as a centre, with a radius equal to its distance from the centre of the circle or of the ellipse, give the points *a* and *b*, through which diameters can be drawn in the circle whose shadows, drawn through the same points to the centre of the ellipse, are axes or principal diameters of the ellipse, both sets of diameters making right angles with each other.

240. As the centre of the ellipse is the shadow of the centre of the circle, the line that joins these centres may be considered to give the direction of the light, and lines drawn parallel to it through the extremities of the diameters of the circle will give the extremities of the corresponding diameters of the ellipse, or the length of the axes.

241. This operation, though long in the description, is simple in practice, and requires very few constructive lines, as is seen in Fig. 49, *b*, in which the operation just described is repeated with no more construction lines than are necessary.

This method is used, as has been said, in finding the axes of $A^2 A^2$, $B^2 B^2$, and $F^1 F^1$, and all the necessary construction lines are given.

242. The three figures 45, 50, and 51 are greatly reduced in size, and the station point accordingly brought nearer the surface of the paper than it is easy for the spectator to get. The drawings accordingly appear considerably distorted. These distortions will form the subject of the next paper.

THE FRENCH EXHIBITION.

II.

THE great Exhibition of Paris is by no means confined to the contents of the Exhibition Palace proper. Vast as this structure is, with annexes to be measured by the furlong, which line the left bank of the Seine, there is a large addition on the right bank. It is only a complement of the great achievement of the year, but it will perhaps prove to be the greater attraction of the two. If a happy situation, an effective arrangement, and the choicest display do not establish that claim, it will be because the crowd of sight-seers prefer a garish collection of modern wares to works of older character and higher merit.

This second "palace" is built of solid stone, and is permanently added to the possessions of Paris. If such enormous sums are to be spent on a great national gala, lasting only for six months, it is cer-

tainly good policy to get some permanent good out of it. If the "happy influence of exhibitions" is a matter open to grave question, a fine building or a new quarter for the capital is an advantage about which there can be no question. An equivalent gain came to us from the great glass conservatory of Hyde Park. That structure was modest. It gave the utmost accommodation conceivable in a given space. It was nothing to what is to be seen in Paris, yet it was by no means small, measuring as many feet in length as the years that marked its date, — 1851 or thereabouts. It was of manageable size, and perhaps gave us quite as much walking as we ever want to accomplish on such occasions. The result was that it left us, what no other such exhibition has left our own or any other nation, a handsome balance in cash. The world was at peace, and the times were good. Even had they been bad the expenses would probably have been well covered. As it was, there remained £150,000 or more for the commissioners to dispose of. Of the Horticultural Gardens it is perhaps as well not to speak; but a great London estate, wide roads, and a number of other advantages, much needed in this metropolis, owe their existence to that fund. If we look at the quadrangle of the South Kensington Museum, a dismal set of decorations representing the exhibition and the commissioners remind us that a first impulse was given to the riches of the museum collections from this same source. Nor is this fund by any means yet exhausted. It is to be regretted that nothing worthy of the immense cost incurred in 1862 remains to us. Efforts were made to induce the legislature to preserve the hideous mass of stock brickwork and the dumpy towers that gave entrance to the galleries in Cromwell road; but the ugliness of the building proved its condemnation. The walls were pulled down and the towers blown up by the royal engineers. The great Crimean General Todleben witnessed the last operation, and learnt how little powder is requisite to get rid of an exhibition.

"They order these matters better in France." A handsome building remains in the Champs Elysées from the year 1855, large enough for exhibitions of every kind, including just now a "concours hippique," — in homely English, a horse show. The theatre and galleries of the Trocadéro will be a far more ambitious monument, whether equally serviceable in ordinary times or not. The Superior Commission for International Exhibitions determined to exhaust the inventive genius of French architects in procuring the best and fullest collection of notions attainable regarding their future show-room. Notice was given for a competition of designs; and this notice produced ninety-four different plans. None answered the requirements of the occasion; nor was any one deemed worthy either of the first prize or of the second. A dozen were selected, and their authors compensated by money awards; while from this set of proposals were gathered the parts, proportions, arrangements, and decorations of the various constructions since carried into effect. Some projects were wild enough. Two of them suggested the Bois de Boulogne as a site; one the race-course of Longchamp; others preferred the wood of Vincennes. One adventurous artist was for closing in the court of the Louvre and the Place du Carrousel, connecting it by covered corridors with the terraces of the Tuileries gardens, and thence, by two suspension bridges passing over the Place de la Concorde, with the Champs Elysées, the whole of which space was to be covered in. The time-honored garden itself was to be wholly renewed, the Seine to be crossed by arches, and more space over the river covered in than we have courage to describe, — an embarrassment of riches with a vengeance. The connection of the two sides lying right and left of the river was proposed by the officials composing this superior council, at the suggestion, we believe, of M. du Sommerard, the director of the Musée de Cluny. The proposal went no further than to place a temporary building on the right bank, as on the left; but an arrangement has been made by the treasury or the government with the municipality of Paris, and this part of the Exhibition is massively constructed in the beautiful white stone of which Paris is built. The total estimate for the expenses of the Exhibition was £1,400,000, with an excess of £360,000 for the Trocadéro. But, as it is now built, a much larger sum must have been spent. The Trocadéro is a hill rising rather abruptly from the bank of the river, like the height crowned by Windsor Castle. It was ascended by a broad flight of steps from the quay, and it received its name from a position near Cadiz stormed by French troops in 1823. From the summit there is a noble view of Paris, the river, and the surrounding country, dominated westward by the frowning walls and batteries of Mont Valérien. During the siege of the Commune in 1871, a formidable battery was placed there by the besieged, and it had to be stormed and taken in a bloody encounter. Heavy guns in such a place held every tower and dome of Paris at their mercy. The space now taken up by the galleries corresponds in width, or appears to correspond, with the Champ de Mars. Between the two runs the river, which is spanned by the bridge of Jena. Here, too, we pass across historic arches, for the bridge narrowly escaped blowing up by the Prussians during the occupation of 1815. It bore an unfortunate name, but it was saved by the Duke of Wellington. The bridge itself, though of good breadth, was not wide enough for what is now required, and a floor has been laid on iron joists from one parapet to the other. By this means the level of the bridge is raised to that of the made ground in front of the two Exhibitions, and the floor is carried twelve or thirteen feet out on each side, in addition to the original width. Between the new floor and the old roadway are laid the large iron pipes required for the

numerous fountains in the surrounding grounds, and for the supply of boiler houses and other requirements of the Exhibition proper. The flight of broad steps under the hill has been removed, the ground is carried down by various inclines, up which pass broad drives and walks, and the whole space is turned into a park, sown with grass and planted with trees and shrubs. But the great sight is the hall of the Trocadéro itself. A vast semicircle starts from the edge of the hill, bringing the two extremities well down the slope, where they end in square towers or "pavilions." From point to point the diameter reaches to some twelve hundred feet. Round the inner circuit is carried a gallery or colonnade. It rests on substructions, and is roofed over with Spanish tiling. The walls behind the pillars are red, and from column to column runs a balustrade of light red terracotta. This colonnade struck us as the most pleasing thing about the composition. In the centre of this long space the "Palace" is constructed. It is circular, and contains an amphitheatre with galleries round it. The hall is about thirty feet less in each dimension than the Albert Hall, and it is said to be perfection as to hearing. Two great square halls flank this central one, and these give access to the picture-galleries, which lie behind, and rise above the outer colonnades. The theatre is surrounded externally by two lofty galleries, the upper one arched. These galleries carry the circle conspicuously out on the face of the hill, and give a kind of shadowy impression of a vast cathedral apse with open arches round it. As this colonnade projects into falling ground, it is placed on massive substructions of stone-work. From the centre a projecting portico is carried. It supports colossal figures representing the different races of mankind, and covers a grotto or tunnel looking like the inlet to the bowels of a mountain, through which one might reasonably expect the issue of a great underground river. In fact, this is where the water does begin. A fountain of great water capacity flows from the top of this construction, falls over the arch, and thence to a series of broad basins flanked by narrower divisions containing bronze fountains. So it falls from one to another in a series of reservoirs, such as visitors to Paris may remember to have seen at St. Cloud.

Nor is the element of height, so well understood by French architects of all ages, neglected; the core of the round building is raised above the tall arches of the ambulatory. It is lighted by wide windows filled with ungainly tracery, and the intervening piers are topped by square machicolated tower-shaped masses of stone-work. These details are not agreeable; but the proportion and arrangement may be alleged in extenuation. Two lofty square towers are carried from the centre of this mass to a height of over three hundred feet, one on one side of the theatre and one on the other. These are crowned with battlements resting on deep machicolations and capped by covered canopies. Lifts are arranged inside, and visitors can be whisked up into the clouds, and will see things unimaginable by old-fashioned travellers. We must hope that despairing love and disappointed ambition may not revive a mania which in France has been too often put to terrible proof by such suggestive opportunities for a rash leap.

This range of buildings, seen from the terrace of the iron exhibition, half a mile away, will impress all admirers of bigness. Great fault has been found with the architecture, which is of no style, and borrows from half a dozen. The colonnades are Italian, the towers half Moorish, half Florentine, the window tracery of the heaviest Transition kind. It is called an adaptation of Oriental, and there are many varieties of Oriental architecture. The general disposition of the main block suggests that of some of the many-towered Rhenish churches. But the whole result is stamped with enterprise. There have been two architects, MM. Davioud and Bordaïs. One has perhaps given shape to the composition, the other filled in the detail. If these gentlemen mean to propose to us a new style of architecture, we trust they will meet with disappointment; but the architects have no doubt executed a clever and bold stroke of scene-painting developed into real construction. The site adds not a little to its imposing presence. The admirers of the composition will very likely say that the ranges of building are such as they have seen in Martin's pictures, — the council chamber, for instance, of the fallen angels, or the hanging gardens and halls of Babylon. At a distance where the towers only are visible, ugliness emphatically asserts its rights.

In the theatre all the great ceremonies of the Exhibition are to take place, — the distribution of prizes and medals, and musical concerts of many kinds. The different nationalities have arranged, or are expected to arrange, representations of their national musical compositions. Mr. Arthur Sullivan will be the leader of the English performances. How funds are to be provided, and how far the expenses of these concerts are to fall upon the resources of the different commissions, is not told. Our own representatives are passing poor on fifty thousand pounds, for much has to be done, and from such penury no very wide margin is to be expected for pleasant sallies of this description. Some musical societies will give their services gratuitously, — Leslie's choir, for instance. Still we must hope that if important performances are projected the best professional skill may be secured by some means or other. Another use of the theatre is the holding of "conferences" on various subjects connected with arts, health of towns, sciences and 'ologies, one knows not what. If this scheme is carried out, there will be curious things to be heard. As each professor may hold forth on his own theme and in his proper tongue, the audiences will perhaps be often rather limited.

In sober earnest, it is to be regretted that strangers collected from the *orbis terrarum*, many of them bringing objects or plans well worth more attention than can be bestowed on all of them together, should be hustled as all must be. The most interesting of all the exhibitors will be inventors and enthusiasts. Such men have usually worked by a spark of strange light which has been wholly their own. Whether what they offer to us is measurable by the rules of reason, possible, or endurable if possible, there is at all events something in such men well worthy of a hearing. Under the glare of glass and iron, flags and stripes, and the jangle of a hundred thousand tongues, what can be listened to that requires patience or attention? Mixed juries, again, are not tribunals for judging brains. The things to be seen are too many. The largest objects, the costliest productions, perhaps the pictures and statues which least call for care and reflection on the part of the observer, — these will win the day. Indeed, when actual medals and rewards are to be distributed, considerations political, international, or commercial — in a word interested — may often help to decide claims which are professedly tried with an impartiality inflexible as fate. Good as the idea of holding international scientific conferences may be in the abstract, it must be doubtful whether much will come of it while so noisy and fatiguing an atmosphere keeps natives and strangers at fever heat.

The gardens of the Trocadéro will be a real joy to the wearied wanderer in Vanity Fair. Here also he may turn into various buildings, some of considerable size, for which there has been no room found round the main structure of the day. The French have an Algerian house of large size, enclosing a court and dominated by a tower, all the walls of dead cold white. It contains what Algiers has contributed of an attractive kind, and rivals in some sort the admirable show we make with our Indian jewels, shawls, carpets, and fine wares of every kind in the grand vestibule. Then the Japanese have an admirably arranged out-building where the national manners and daily life may be studied in action. There are other dependencies of different national sections here. Of the much-wanted eating-places two are provided in the middle of the grounds. The happy traveller who secures a table at either with something on it may cast his gaze over a lovely landscape and enjoy that element of god-like feasting, the sight of good men struggling with adversity below. Anyhow, the gardens, the shrubberies, and the grass (when it is grown) are real charms in the middle of such a collection of men and things, — the men so loud, and the things so heaped together. On a sort of no man's land, down by the level of the river, is the exhibition of boats and things marine. All these curiosities are but transitory, and happily they will disappear in six months; but the Trocadéro will remain as a permanent acquisition to the capital. No small praise is due to the republican municipality which has known how to turn a momentary fit of extravagance to such good account. — *The Saturday Review*.

THE PRIZES OF THE BOSTON SOCIETY OF ARCHITECTS.

THE committee of the Boston Chapter of the American Institute of Architects has awarded the annual prizes of the chapter for the best work of the year in the Department of Architecture of the Massachusetts Institute of Technology, as follows: a first prize to Alfred S. Higgins, of Boston; a second prize to A. W. Longfellow, Jr., of Portland, Me.; an honorable mention to George C. Grover, of Dedham.

Mr. Higgins is a graduate of the Institute, of the present year. Mr. Longfellow and Mr. Grover are special students in the department. The prizes are given in books, of the value of fifty dollars.

THE QUALIFYING OF ARCHITECTS.

NEW YORK, June 11, 1878.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir, — With regard to the qualifications of architects, permit me to make what would seem to be a practicable suggestion.

Let the Institute of Architects arrange to hold an examination annually, at such a season as shall appear to be most convenient. Let those who succeed in passing the examination receive diplomas, certifying the capability of the holder. The details of this plan might be arranged by the committee appointed to take charge of the matter. Thus, it might be advisable to hold examinations in various branches, in wooden, iron, and stone construction, and in other departments; but it would probably be better to confine the inquiry to such general principles as are necessary for all to know who desire to practice as architects. The examination might be either in writing, as supposed by one of your correspondents, or might consist of what, in schools of science, is called a *projet*, namely, a complete design for an appointed work, with drawings, descriptions, specifications, and estimates. As to design, any criterion in that would appear impossible for the present. Where men of eminence show such striking differences both in theory and in practice, any attempt to set up a standard in such matters would be vain. The advantages of this scheme are evident. The diplomas would be a recognition of merit where it existed, while it could not be inferred that those who were without this evidence were incapable. The profession generally, from whom, it has been said, much opposition would come, and particularly the Institute members, would have the honor and glory of granting their certificate, through their committee, to

future aspirants, while this position would in itself proclaim them as not requiring such evidence to support the testimony of their long practice and well-deserved success.

If this scheme should be found worthy of consideration, action cannot follow too soon. If it should be determined to hold an examination next winter, it is full time now to determine its method and scope.

Several months beforehand it should be announced, with careful mention of the ground that it will cover. Even if only two or three should avail themselves the first year of its privileges, no discouragement should be felt. Slow growth is often necessary for stability, and by the gradual adaptation to the general needs that experience would effect, we might yet see an extension of professional organization that would be a benefit to the community and a credit to its founders.

JOHN BEVERLEY ROBINSON.

NOTES AND CLIPPINGS.

MR. SCHLEICHER'S PUBLIC BUILDINGS BILL. — Mr. Schleicher closed as follows a speech made June 13th, in the House of Representatives, on his Public Buildings Bill, which we have before discussed (*American Architect*, No. 127). "The following facts are worthy of consideration: In the last ten years the annual appropriations for erecting public buildings have aggregated \$43,536,905.86; adding to this ten years' rentals at the rate of \$1,250,000, make an annual average expenditure of over \$5,500,000. The adoption of the measures proposed by this bill would reduce this expense to \$2,000,000, namely, \$1,600,000 interest on forty millions of bonds, and about \$400,000 for rents of small post offices and other buildings, in locations where the rents being paid are not sufficient to justify building. All the buildings now being erected, and hereafter every building which is begun, will be finished without interruption in as short a time as consistent with good construction and careful work."

BEDS OF CEMENT. — A company of New York city and Ulster County capitalists has been organized to work the cement beds and quarry located near the Orange and Ulster county line at Hampton, seven miles north of Newberg. The cement vein averages thirty feet in depth, and is classed by experts as "black and white Portland." The quarry is extensive, and will furnish the bulk of the stone for the Poughkeepsie bridge caissons.

THE FINANCIAL RESULT OF THE EXHIBITION. — The expenses of the French Exhibition will probably amount to 50,000,000 francs, and it is almost certain that the receipts cannot cover the expenditure. The commissioners, however, maintain that the deficit will be inconsiderable. They count upon a certain receipt of 34,000,000 francs, of which 14,000,000 will be from entrance tickets, and they believe that the sale of materials will realize 7,500,000 francs; they calculate that 28,000 tons of iron frames and plates will be disposed of, at an average of 20 centimes (4 cents) the kilogramme, making 5,600,000 francs, and that the cast-iron pillars, weighing 6,000 tons, at 16 centimes the kilogramme, will bring 960,000 francs; 7,000 steres of woodwork (the stère is a French measure of a little over 35 square feet), at 20 francs each, will give 140,000 francs; 40,000 metres of sheds, at 10 francs the metre, 400,000 francs; and if the remainder of the materials do not balance the account, the State can easily make up the deficit by a tax of some kind.

THE NATIONAL FAÇADES. — The Belgian façade is said to be the largest and best built, as well as the most costly façade (it is said to have cost \$120,000) in the Rue des Nations in the Exhibition Building. It is a reproduction of the Hôtel de Ville at Bruges, which, though begun in 1377, is mainly of the sixteenth century.

The Portuguese façade is a reproduction in plaster-of-Paris of the famous porch of the Belem Monastery.

THE GERMAN EXHIBIT. — The Germans have in part made up for their churlishness in refusing to take part in the Exhibition, by sending a large number of works of art; among them are some ninety subjects submitted by Berlinese artists.

BELGIAN IRON. — The *Pall Mall Gazette* says that Belgian iron-masters are able to buy, and have bought, pig-iron in England, carry it to Belgium, work it, send it back to England, and deliver it in manufactured form, even in the iron-districts themselves, at a price below what it would cost English manufacturers to make it on the spot. The reasons adduced for this statement are the facts that owing to improved processes much coal is not needed, and that wages which were eleven francs in 1872 have fallen to four francs at the present time, and yet the men have not struck; hence the masters have been able to carry on their works without interruption, and can underbid English dealers, whose expenses are made heavy by the wages that fear of strikes compels them to pay their men. The reason that Belgian workmen do not strike is that if they do strike they must support themselves, for there are no poor-rates for them to fall back on. Moreover, the Government is very summary in its dealings with strikers, for, feeling that its first duty is to protect peaceful industry, it calls out troops at the first note of a disturbance, and quiet is restored at any price.

DECORATING ST. PAUL'S. — An effort is making to raise \$200,000 for the decoration of St. Paul's Cathedral in London with mosaics, the designs for which have been entrusted to Mr. Leighton and Mr. Poynter.

A BALLAST HILL. — The local government board of Newcastle-on-Tyne has been memorialized to the effect that leave may be granted to build certain artisans' dwellings elsewhere than on Miller's Hill, for it appears that this hill, which is some fifty feet above the level of the streets, has been formed by ships' crews who have dumped there the sand, clay, or gravel which their vessels carried when they had come in ballast to that port in search of a cargo; and therefore the site could become suitable for building only by surrounding this artificial hill by a costly retaining-wall, or by entirely removing the hill.

THE STATUE OF VOLTAIRE. — M. Davioud, one of the architects of the Palace of the Trocadéro, has lately received rather a rebuff, in the resolution passed by the municipal council of the city of Paris, in the matter of condemning one of the fountains of his designing in order to provide a place for the new statue of Voltaire. One of the passages of the order was as follows: Considering that the fountain of the Château-d'Eau produces a bad effect, and that it is so defectively built as to require repeated and costly repairs, — *Resolved*, that the statue of Voltaire be erected in the Place Château-d'Eau on the site of the fountain, which shall be suppressed.

HUMORS OF RUSSIAN BRIDGE-BUILDING. — Much interest was felt, six months or so ago, in a pontoon-bridge which the Russians proposed to build over the Danube. Its novel feature was the employment of immense cylindrical floats of sheet iron, which were to carry the road, and were constructed on curious principles. The undertaking, however, was most certainly never achieved, and some inquisitive mind has hunted out these facts of its history, not as yet officially published. The cylinders were all made by Prussian iron-works on the Rhine, but never reached their destination, the seat of war. The Russian railroads found them too large to be readily transported. Nowhere were the roads, at that time in an especially disordered state, able to procure the cranes and derricks necessary for unloading and reloading these monsters. The cylinders were therefore divided into sections and placed on separate cars, which continued to block up the tracks, from last October until very recently. Many cars were scattered in Roumania, and one hundred and twenty loads found their way, in some wonderful manner, to Odessa. The impossibility of ever fitting together these separated and scattered pieces was evident, and every car bearing part or parts of an iron pontoon bridge has been, by an ukase, ordered back to Warsaw. The one hundred and twenty loads from Odessa had travelled more than sixteen hundred miles.

THE "PILE-BUILDING PERIOD" OF SWITZERLAND. — In the winter of 1853 it happened that the waters of the Lake of Zürich sank lower than they had ever been known to do before; and the people of Mien, who had seized this opportunity of completing some buildings along the shore, made the discovery that here, too, there were numerous old sharpened stakes, as well as pottery and articles made of stone and bone. The news soon reached the ears of the scientific world, and much zeal was shown in exploring the bottom of this and the other lakes of Switzerland; and the result of these investigations was that much light was thrown upon the "Pile-building Period," as the German scientists have named it, an age which dates back more than 5,000 years before the dawn of history, and had until now been completely hidden from us. More and more discoveries were made. As soon as the dwellings of that time had been reconstructed, — by no means an arduous task, — the domestic utensils and hunting weapons, and the remains of plants and animals, all seemed to find their proper places. No doubt remained as to the manner of life led by these ancient people, and although we may have no positive assurance as to their name, we are able to divide the time of their existence into three well-defined ages, called respectively the Stone Age, Bronze Age, and Iron Age, according to the materials of which their weapons and implements were successively made. The Stone Age, of course, was the earliest; the Bronze Age showed some advance in civilization; and with the Iron Age we come to the times of the Romans. All the lakes have yielded more remains of the Stone Age than of either of the two others; but all three periods may be best studied at Neuchâtel. — *Exchange*.

A REMARKABLE NARROW-GAUGE RAILWAY. — The *Railway Age* says: One of the most remarkable examples of engineering enterprise and boldness is found in the narrow-gauge extension, just completed, of the Colorado Central Road from Black Hawk to Central. The distance between these two places is one mile; but to accomplish it the road has to climb an elevation of 563 feet, by a route 4½ miles in length. The undertaking was pronounced impracticable by many experienced engineers, but has been successfully accomplished by means of zigzagging switches, heavy rock cuts, some of them 50 feet deep, four bridges, numerous deep fills, one of 100 feet, and heavy masonry. The work, which is of the most substantial character, is said to have cost \$15,000 per mile, or about \$60,000. A standard-gauge road over this route would have cost vastly more if it could have been built at all, which is doubtful, — a very good illustration of some of the advantages of the narrow-gauge system for special localities.

SOIL POLLUTION. — It is stated that M. Smolensky, who has made many analyses of ground-air, has found that the carbonic acid in the ground-air of districts in which there are many cesspools is distinctly proportioned to the degree of pollution of the soil.

A WOOD STAIN. — The employment of alkaline manganates for imparting to light woods in furniture and floors an attractive, uniform, and durable walnut brown, is highly recommended by M. Viedt. The action depends upon the decomposition of salt in the pores of the wood, with the separation in them of very finely-divided brown hydrate peroxide of manganese, and an addition of magnesium sulphate to the solution is found to hasten the reaction. In practice the following method is said by the *Lumber Gazette* to be successful: Equal parts of manganate of soda and crystallized Epsom salts are dissolved in twenty to thirty times the amount of water at about 144 degrees, and the planed wood is then brushed with the solution; the less the water employed the darker the stain, and the hotter the solution the deeper it will penetrate. When thoroughly dry, and after the operation has been repeated if necessary, the furniture is smoothed with oil, and finally polished, the appearance being then really beautiful. Before smoothing, however, a careful washing with hot water will have the effect to prevent the efflorescence of the sulphate of soda formed. In the treatment of floors, the solution may be employed boiling hot, and, if the shade produced is not dark enough, a second application of a less concentrated solution is made; after it is quite dry it is varnished with a perfectly colorless oil varnish. On account of the depth to which the coloring solution penetrates, a fresh application is not soon required.