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VOL. XXXIII

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ARCHITECTURE

ENGINEERING

DECORATION

TICKNOR & COMPANY

CONSTRUCTION

BOSTON MASS.

CONTENTS.

EDITORIAL SUMMARY.
GERMAN ARCHITECTURE.—IV.
ARCHITECT, OWNER AND BUILDER BEFORE THE LAW.—VI.
AMERICAN CONSTRUCTION THROUGH ENGLISH EYES.—III.
ANCIENT ARCHITECTURE FOR STUDENTS.—XII.
BOOKS AND PAPERS.
STANDARDS LOST AND FOUND.
COMMUNICATIONS.
NOTES AND CLIPPINGS.

UNITARIAN CHURCH, TOPEKA, KAS.
HOUSES AT DETROIT, MICH.
COTTAGE AT NANTUCKET, MASS.

Additional Illustrations in the International Edition.

MODEL OF THE PANTHEON AT ROME.
THE NEW VICTORIA COURTS BIRMINGHAM, ENG.
THE MANCHESTER, ENG., CREMATORIUM.
PLAN AND SECTION OF THE THEATRE, TOURS, FRANCE.
MONUMENT TO LORD FRAZER, EDINBURGH, SCOTLAND.
THE GRAND PRIX DIPLOMA, PARIS EXHIBITION, 1889.
RESIDENCE AT BECCLES, ENG.
ST. THOMAS CHURCH, TELFORD PARK, STREATHAM, ENG.
RESIDENCE, WAKE GREEN ROAD, MOSELEY, BIRMINGHAM, ENG.
THE COUNCIL HOUSE, SHEFFIELD, ENG.
DINING-ROOM IN THE CHATEAU ST. LEGER, ST. GERMAIN-EN-LAYE, FRANCE.

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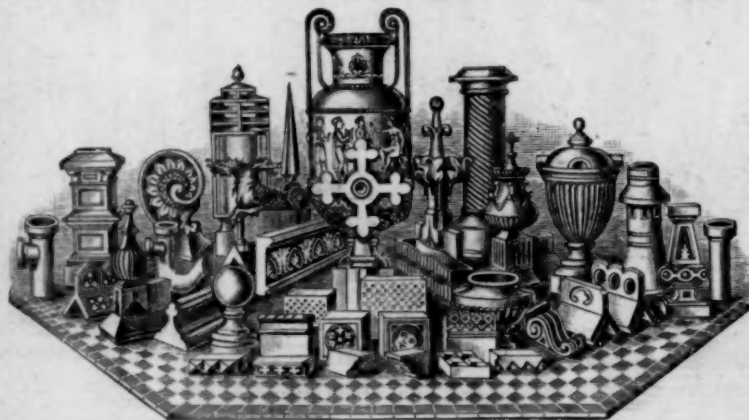
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VOL. XXXIII.

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AUGUST 29, 1891.



SUMMARY:—

The Competition for the Rhode Island State-House and the satisfactory terms of Competition.—Mr. F. W. Smith's Scheme for a National Gallery at Washington.—Some Particulars concerning it.—The <i>Architectural Record</i> .—Proposed Return of the New York Obelisk to Alexandria.—The Accident in Park Place, New York.	125
GERMAN ARCHITECTURE.—IV.	127
ARCHITECT, OWNER & BUILDER BEFORE THE LAW.—VI.	129
AMERICAN CONSTRUCTION THROUGH ENGLISH EYES.—III.	131
ANCIENT ARCHITECTURE FOR STUDENTS.—XII.	132
BOOKS AND PAPERS.	134
ILLUSTRATIONS:—	
Building of the American Trust, Loan and Guaranteed Investment Company, Philadelphia, Pa.—Randolph Macon Woman's College, Lynchburg, Va.—Casino at Meyer's Lake, Canton, O.—Unitarian Church, Topeka, Kans.—A Pair of Double Houses at Detroit, Mich.—Cottage at Nantucket, Mass.	135
Additional: Plans and Section of the Theatre at Tours, France.—The Manchester, Eng., Crematorium.—Model of the Pantheon at Rome.—The New Victoria Courts, Birmingham, Eng.—Monument to the late Lord Frazer, Edinburgh, Scotland.—The Grand Prix Diploma: Paris Exhibition, 1889.—Residence at Beccles, Eng.—St. Thomas's Church, Telford Park, Streatham, Eng.—Residence, Wake Green Road, Moseley, Birmingham, Eng.—The Council House, Sheffield, Eng.—Dining-room in the Château St. Leger, St. Germain-en-Laye, France.	138
STANDARDS LOST AND FOUND.	138
COMMUNICATIONS:—	
The Formulas for Deflection of Beams.—The Temple of Baal.—The Calvert Monument at St. Mary's, Md.—Books on Bridge Building.—Misuse of the Word Etching.	139
NOTES AND CLIPPINGS.	139

THE State of Rhode Island is about to select a design for its new State-house in Providence, by what may be called very nearly a model competition. Messrs. Hoppin, Read & Hoppin, and Messrs. Stone, Carpenter & Willson, and W. R. Walker & Son, of Providence, and Messrs. Carrère & Hastings, McKim, Mead & White and J. C. Cady & Co., of New York, and Messrs. Shepley, Rutan & Coolidge, of Boston, have been invited to submit designs. For each design, which shall be certified to by the expert architects who will assist the Commission, as complying with the conditions of competition, one thousand dollars will be paid, provided that its author shall have made no attempt to influence the decision of the Commissioners or their advisers, and that it shall appear that the probable cost of carrying it into execution will not exceed by more than twenty-five per cent the limit of one million dollars fixed by the conditions; but the property in the plans still remains in the architects submitting them, and they are only to be used, in whole or in part, by agreement with their authors and further compensation. From the designs furnished which conform to the conditions, one will be selected, which shall be presented to the General Assembly of the State as the design for the new building; but this design shall still remain the property of the architect or firm who made it, and is not to be used, in whole or in part, unless such architect or firm is employed to carry his plan into execution according to the rules of the American Institute of Architects. It will be observed that the programme does not absolutely promise the execution of his plan to the author of the design selected; but, as the Commissioners are only authorized to present a plan, but not to engage an architect, they were unable to bind the State any further. It was, however, within their authority to promise that the design selected by them should not be used without proper compensation to its author, and this they have done.

ON the whole, this promises to be the most satisfactory competition for a public building yet held in this country. The Commission has chosen a list of competitors, any one of whom will do himself and the State credit, and has promised to choose one of the designs, instead of "reserving the right to

reject all," as is usually done where some contemptible fraud on competitors is intended. It is needless to say that none of the architects invited would have had anything to do with a competition in which this promise was not made them, but it is none the less gratifying to find how frankly and readily the Commissioners have acceded to the principles of fair competition, as recognized by architects the world over, and by the public in the most civilized communities. On its own side, the State, by its honorable and businesslike arrangement with its architects, will gain what few public bodies in this country are able to get,—the best service of some of the best men in the profession,—and its building, if it is carried out in the same spirit as that shown in the selection of a design, will be an honor to the community which possesses it. We hope and believe that this excellent example will be widely followed by similar bodies, and that the day of competitions decided by bribing janitors, or exercising "pressure" upon legislators, which find their natural outgrowth in the ludicrous design, the tottering walls, the galvanized-iron ornaments, the collapses, investigations, recriminations and repairs characteristic of our public architecture, is nearly over in this country.

MR. FRANKLIN W. SMITH has published an interesting and really valuable pamphlet in aid of what he calls the "Propaganda for the National Gallery," which he wishes to see established in Washington. Our readers already know something of his plan, which contemplates the erection of a vast group of buildings, to be executed, for the sake of cheapness, in concrete, and to afford room for collections of artistic objects of the most varied kinds. Mr. Smith is unquestionably an enthusiast on his subject, but he seems to be a sincere and unselfish one; and the means which he proposes for carrying out the scheme are perfectly reasonable. Although a hundred acres or so of gallery-room seems extravagant, even for Washington, Mr. Smith mentions that, less than twenty years ago, a Swede began in Stockholm a modest museum, to contain only articles illustrating the past and present of Scandinavia. His efforts attracted attention and support, and the museum which he began now fills five large buildings; and there can be no doubt that the intelligence, wealth and public spirit so characteristic of Americans would soon suffice to fill at least a very large group of buildings with valuable objects.

WHILE Mr. Smith's pamphlet is rather more enthusiastic than coherent, one cannot read it without respect and admiration for its author, who, according to the modest account which he gives of himself, was a merchant in Boston, with, however, like Fergusson and Schliemann, a passionate love of architecture and history, and a mind singularly active in many ways. So long ago as 1851 he was able to indulge himself in a trip to Europe, where, after visiting the World's Fair at London, he made a prolonged tour, bringing back with him notes, photographs being then unknown, from which, in his intervals of leisure, he constructed models of Jerusalem; of localities in Wittenberg, "hallowed," as he says, "by the history of Luther, Melancthon and Frederick the Elector;" of the mediæval Micklegate of York; of the Porta Maggiore at Rome; Giotto's Campanile; the Wartburg; Holyrood Palace; Kenilworth Castle, and other buildings. Since then, he has made sixteen foreign journeys, devoting himself partly to the study of museums, and partly to actual buildings. As his means and leisure increased, his artistic ambition grew with it; and, after a visit to Spain, he resolved to build for himself a Moorish house at home. This idea was carried out in the Villa Zorayda, at St. Augustine, Florida, which was executed entirely in concrete, even to the raised patterns on the walls. This house was richly furnished with Oriental objects, and has since formed Mr. Smith's winter residence. The success of his first venture induced him to attempt a much more important undertaking, the construction, at Saratoga, N. Y., of a Græco-Roman house, so far as possible a reproduction of the house of Pansa, at Pompeii. This building, which is two hundred feet long, and seventy-five feet wide, is carried out, like the Villa Zorayda, in concrete, and, fully furnished with reproductions from antique objects; it forms the summer residence of its owner, as well as one of the most popular curiosities in New York State. Although it was only recently finished, and is

little known as yet, Mr. Smith tells us that, within eight months after its completion, it was visited by over twenty-four thousand people. His "Propaganda" pamphlet contains, naturally, a considerable number of illustrations, by photographic process, of interiors in these beautiful buildings, to show how interesting collections, shown in this way, may be; and, besides these, there are many photographic plates, plans, and reproductions of woodcuts, drawings and engravings, of foreign museums, buildings and objects, and of the designs for the projected gallery in Washington. All the borrowed material is conscientiously credited to its source, and Mr. Smith, with a modest apology for making himself "inevitably," as he rightly says, so prominent in the book, invites from all sources suggestions for improvements in the scheme, in which he has, as he says, "an intense interest." We sincerely wish that he may see his desire fulfilled, and that a National Museum, after his plan, may speedily be commenced. As the promise of money is the first thing necessary, he proposes that, as with the foreign museums, the donors of a certain sum, say one hundred thousand dollars, shall be known, and celebrated in the catalogues, as Founders; those who give or bequeath one thousand shall be immortalized as Benefactors; those who give one hundred, as Patrons, and so on. Meanwhile, he proposes to continue the "propaganda" by the free distribution of his pamphlet to public institutions, members of Congress, colleges, academies, superintendents of schools, and so on, and its sale at a nominal price—fifty cents—to the public generally. Mr. Smith disarms possible suspicion as to the honesty of his motives, by assuring his readers that he does not own a foot of land in Washington, and that the construction of the building would be of no pecuniary advantage to him; and it is impossible to read his book, and reflect on what he has already done in pursuit of his ideas, without believing him. If any one wishes to share in the propaganda, or to possess Mr. Smith's book, he should write to the Office of the Propaganda, 1419 F Street, Washington, D. C., or directly to Mr. Franklin W. Smith, at the Pompeia, Saratoga Springs, N. Y., the latter only from May to November.

WE have very great pleasure in welcoming to architectural journalism one of the most satisfactory periodicals which has yet been devoted to architecture in any country. This newcomer is a quarterly, to be known as the *Architectural Record*, and if it is to fulfil the promise of its first number, we advise those of our readers who like to see architectural subjects of permanent interest treated by writers who understand them, to lose no time in sending one dollar to its publishers, at 14-16 Vesey Street, New York, for their first year's subscription. In their introductory address, the conductors of the new review say that they have undertaken to enter a field which must be entered with serious purpose, or not at all, and all thorough architects will agree with them that, while the occupation of this field imposes grave responsibilities, it greatly needs to be occupied; and that a magazine which will faithfully fulfil the duties incident to such a position may do incalculable service to the cause of art in this country, and, perhaps, later, elsewhere. We believe that architects everywhere are heartily sick of seeing professional periodicals either padded with disquisitions which seem to have been composed by second-year students in the professional schools, or devoted to the personal advancement of some small clique of practitioners; and will welcome with much satisfaction a publication from which even the best of them may learn something to help him in his work, while it will offer a still more valuable service, one, too, which it is hardly possible for a weekly journal to render, in the form of honest and intelligent criticism of current architectural work. Not only is it almost impracticable for a weekly journal, which must rather reflect the course of events than comment upon them, to undertake this latter task, but the criticism which will be of most service to architects should generally have something of the lay character which a quarterly review may possess, as distinguished from the intimate connection with the members of the profession more proper to the weekly periodical. In fact, the criticism of a well-instructed amateur is perhaps more useful to architects than that of a member of their own profession, who, while he comprehends their difficulties better, is more likely to be biased for or against a particular school, and may have personal relations, which, if they do not warp his judgment, hinder the free expression of it; and if, as we suppose, the new review intends to give a considerable space to such criticism, its value to the profession is

assured. The first number contains an article on the Romanesque Revival in New York, by Mr. Montgomery Schuyler, which, we need not say, is a model of conscientious work of the kind, and we hope is only one of a series. We find also, among other things, an interesting article on the New York Building Law, by that most earnest and untiring advocate of improvements in the statute, Mr. William J. Fryer, Jr.; a reprint of a part of Professor Aitchison's admirable Royal Academy lectures on Byzantine Architecture; a very good paper on plumbing, by a contributor who modestly signs his initials only; and a review, much too short, of Professor Moore's book on Gothic Architecture. This last is by far the best review we have yet seen of Professor Moore's book, and, it seems to us, the best review of an architectural book that has yet been published in this country. We say that the book-review is the last article in the number; but there is a chapter of a novel, which would have the air of having been accidentally bound up with the rest of the magazine, if it were not mentioned in the table of contents on the cover. We must confess that we have left the reading of the novel to a more convenient occasion, so that any comments we might have to make on it will be deferred. There is, however, a criticism on the general appearance of the magazine, which we will make now, but with a recommendation to mercy, as we know the difficulties which beset the writer on architecture in search of appropriate illustrations. While the present number contains sixty-four illustrations, of one sort or another, and while all are interesting and valuable, their effect is woefully injured by their heterogeneous character, and the curious manner in which they are scattered through the pages, without any regard, in many cases, to the text which shares the space with them. The best of the illustrations are process-plates from nature, well made and well printed, but some appear to be reproductions of wood-cuts, and others are copied from pen-and-ink drawings, of varying degrees of merit. Mr. Schuyler's paper, for example, might, with very little difficulty, have been immensely improved by illustrating it entirely with process-plates from the objects themselves, all of which were readily accessible, instead of trusting to office perspectives for representations of many of them; and an article on terra-cotta is by no means happily associated with pictures of brass gas-fixtures. Of course, all this will be corrected later; and in the meantime, we will be quite content with what we have, and, indeed, will be very glad that it is so good.

COLONEL CHAILLÉ-LONG writes to the *New York Tribune*, earnestly urging the return of the obelisk, now in the Central Park, to the place in Alexandria whence it came. He cites the example of England, which, he says, is about to restore the Elgin marbles to Greece, and calls upon Americans to subscribe to restore their obelisk to Egypt. The principal reason for doing so, to our mind, is to be found in the fact that the obelisk is not likely to resist our climate many years longer; and, as every sculptured Egyptian stone is a precious document from a people and age as yet very imperfectly understood, the proper place for such objects is in the country whose climate suits them best, and in the place where their intended relation to other objects can be properly studied; that is, in the place which they came from. With the Elgin marbles the case is different. The probability is that if they had been left in Athens they would have disappeared by this time under the battering of the local vandals; and Lord Elgin unquestionably did a great service to art in carrying them away to a place where they could be preserved and appreciated. Now, however, the London air is beginning to tell upon them, while the Athenians are learning to show greater respect for such objects; and it would certainly be instructive to architects and students to see just how the sculptures looked in the place for which they were made, so that it is not impossible that the transfer of the reliefs back to the Parthenon might now be artistically a good thing, although we doubt very much whether it is likely to take place at present.

IT is doubtful whether the cause of the collapse of the building in Park Place, New York, on Saturday last, will ever be absolutely determined. It is enough at this moment to chronicle an event which has cost sixty or seventy lives without attempting to determine whether the accident was due to structural weakness or to an explosion, similar to that which caused the downfall of a candy-factory in Barclay Street in the same city, in December, 1877.

GERMAN ARCHITECTURE.¹—IV.

SOUTH GERMANY.—(Continued.)



Fig. 14. Gable at Heilbronn.

ure 14). The slaughter-house is a pretty building of the same period with original capitals; the emblem of a lion devouring sausages and a ham is not devoid of appropriateness (Figure 15).

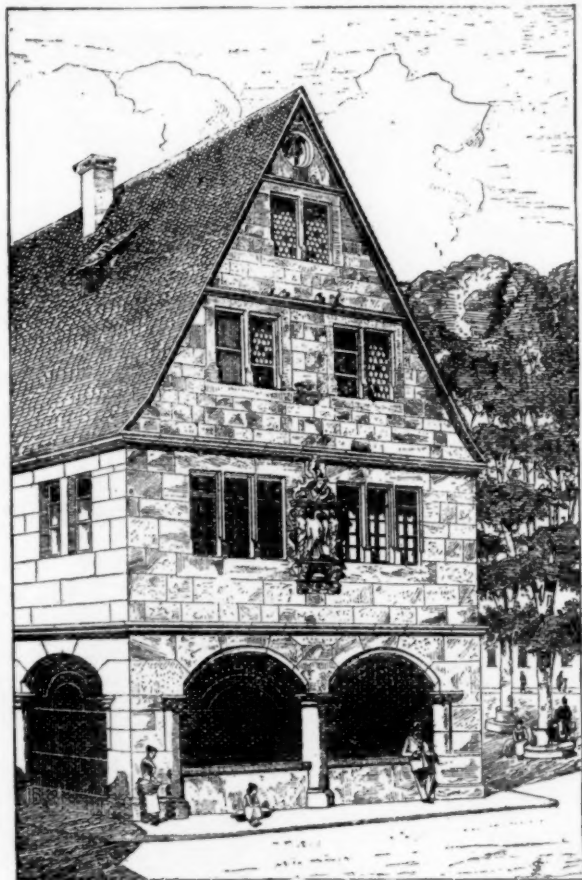


Fig. 15. Slaughter-house at Heilbronn.

Esslingen has a handsome town-hall (Figure 16).

Ulm is rich in interior decorations; the buildings are mostly of brick, with façades painted in sgraffito; some fine specimens of wrought-iron work are to be seen here, and a few remarkable fountains adorn the streets.

¹ From the French of Lambert and Stahl, in Planat's *Encyclopédie de l'Architecture et de la Construction*. Continued from No. 817, page 114.

Augsburg, a powerful and wealthy city, having important commercial relations with the South, early imported the



Fig. 16. Town-hall at Esslingen.

Renaissance from Italy. The Fugger and Welser families and a few other merchant princes possessed of immense riches



Fig. 17. Town-hall at Augsburg.

encouraged the arts; however, not many monuments of the beginning of the sixteenth century now remain. Nearly all

the large public and private edifices are later than 1560. The main street of the town is one of the handsomest thoroughfares in Germany; it is bordered with palaces and adorned with

Elias Holl, who was born at Augsburg in 1573, was one of the ablest of German architects, and he it was who impressed



Fig. 18. Arsenal at Augsburg.

fountains of great beauty; the Hercules and the Mercury, by Adrien de Vries, and more especially the bronze fountain of Augustus (1593) in front of the town-hall (Figure 17) by Hubert Gerhardt, are veritable master-pieces.

Owing to the scarcity of good building stone, here, as at Ulm, decorated stucco coatings and painted façades were very common in the sixteenth century; from the little that now remains of these we can form only a feeble idea of the magnificence of Augsburg in the days of its glory. Michel de Montaigne gives a flattering description of it; he also praises in



Fig. 19. Stadt-Kanzlei at Ueberlingen.



Fig. 21. House at Colmar.

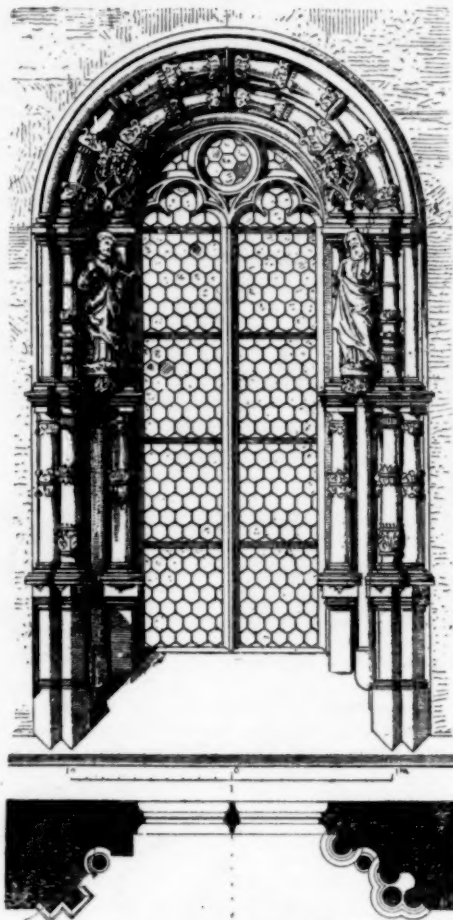


Fig. 22. Window from the Cloisters of Ratisbon Cathedral.

upon the city the stamp which it still bears. Holl had studied the architecture of Palladio in Venice and the cities of upper

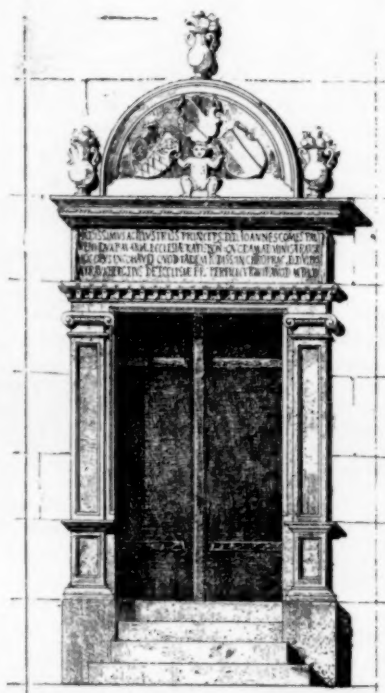


Fig. 23. Doorway in the Court of the Bishop's Palace at Ratisbon.

unqualified terms the neatness and beauty of the cities which he visited in the rest of Southern Germany and in Switzerland.

Italy, and in his constructions he gave a new direction to art at Augsburg. His principal edifices are the foundry, the arsenal

(Figure 18), the bridge of the barefooted Carmelites, on the model of the Rialto at Venice, and the town-hall, which is of a cold, monotonous style (Figure 17), but contains a remarkable hall in the first story. After the death of Elias Holl no more structures of striking merit were erected at Augsburg.

Baden, which has often been ravaged by war, possesses in the north only the two great castles reared by its margraves, Gottesau near Carlsruhe, constructed in 1553, enlarged in 1558, despoiled by the troops of Louis XIV, burned in 1736 and restored in 1740, has, notwithstanding all these vicissitudes, preserved its primitive external architecture, which is commonplace and even excessively uninteresting. Its first proprietor apparently foresaw that it would be converted into barracks in the nineteenth century—the lot, alas, of many other old castles that were deserving of a better fate. Gottesau has, however, found its proper sphere and we will reserve our regrets for a more fitting subject. The castle of Baden, situated on a hill in a lovely country, is in the main also devoid of interest; a pavilion at the angle of the terrace, designated wholly without reason the “Tower of Dagobert,” is in elegant style; it is domed with a lantern borne on eight pillars connected by arches and with half Ionic columns.

The southern section of Baden is richer; Constance and Freiburg in the Breisgau have preserved a few fragments from

In the Palatinate, the old town of Ratisbon (in German, Regensburg) which was the residence of powerful bishops, abounds in monuments of all the periods. In the windows of the cloisters of the cathedral forms are attempted which indicate that the Renaissance made its advent there early in the sixteenth century (Figure 22). These windows are among the oldest examples of the style in these parts. We also give (Figure 23) a portal from the court of the bishop's palace, which bears some evidence of Italian influence. It is dated 1565.

[To be continued.]

ARCHITECT, OWNER & BUILDER BEFORE THE LAW.¹—VI.

THE ARCHITECT'S DUTIES TO HIS EMPLOYER.—THE ARCHITECT'S POSITION IN SOCIETY.

WHERE appears to be a difference of opinion among courts as to the position of architects in society. In Minnesota, their relation to their “customers” has been mentioned in a judicial decision, as if they were merchants of some sort; but in Missouri it has been distinctly held that they practise “a liberal profession,” and this view appears to be rapidly gaining in favor. As professional men, their duty is plainly laid



Fig. 20, Hall of the Château of Heiligenberg.

the latter part of the sixteenth century, but nothing very remarkable. Ueberlingen, a small town on the shores of Lake Constance, possesses, on the contrary, a Stadt-Kanzlei of peculiar character, bearing the date of 1590 (Figure 19). On a hill, not far from Ueberlingen, rises the castle of Heiligenberg, a construction of the second half of the sixteenth century, in which there is one of the largest and finest Renaissance halls in Germany; this apartment is one hundred and eleven feet long, forty wide and twenty-six high. The ceiling is superbly painted in bright colors, and a magnificent fireplace adorns the hall at either extremity (Figure 20).

Alsace can boast of several quite important sixteenth-century structures. The Renaissance was early introduced here, as is shown by the house in Colmar, of which we give an illustration (Figure 21); it is dated 1538. Picturesque wooden buildings of beautiful execution are also seen in Alsace.

down in the text-books, and in many decisions of courts. They are bound to serve their employers with reasonable skill and care, and, of course, with perfect honesty. They are not

THE SKILL AND CARE REQUIRED OF ARCHITECTS.

bound to the utmost skill, such as only a few members of any profession attain to, but they must show what other architects will generally consider to be a reasonable degree of professional intelligence and knowledge. The care and attention, apart from the skill, which they should devote to their employer's affairs, ought to be greater than that which they would bestow upon their own affairs of similar character, in order to satisfy the legal idea of their duty; but the testimony of other architects will be admitted to show whether the care

¹ Continued from No. 815, page 81.

used in a particular instance was all that could reasonably be expected of a conscientious architect under the circumstances.

WHAT ARE REASONABLE SKILL AND CARE?

As might be supposed, the testimony on these points in different cases varies considerably, and, as precise information in regard to decisions actually made is of great importance to architects, it seems advisable, even at the risk of making this chapter rather long, to quote enough from actual decisions of courts of record to show what the judges and the witnesses think under given circumstances; and, in one or two instances, where the architect's side was less favorably presented by his counsel than it might have been, to add some comments, in the hope of assisting the cause of justice in similar cases in future.

In an Illinois case,¹ an architect was employed, by an oral contract, to prepare the necessary plans and specifications for a block of buildings, and to let the contracts for the various portions of the work, and superintend the erection. Shortly after the completion of the block, it was discovered that, in consequence of the imperfect construction of certain dwarf walls, upon which the interior portions of the buildings rested, the floors and interior structure had settled several inches, so as to render the buildings untenable. The owner thereupon caused them to be repaired and put in proper condition, at a cost of about \$2,900, and afterwards brought suit against the architect for about this amount, as damages on account of his negligence. At the first trial, before a jury, a verdict was rendered for the plaintiff, awarding him \$1,441.76, and judgment was entered accordingly. The plaintiff claimed that the defects in the walls "arose from their improper construction, and that such construction was permitted by the defendant negligently, and in violation of his duties as superintendent." The architect asserted that after the walls were built, deep trenches were dug, partly near and partly beneath the walls, for the purpose of laying sewer-pipes and constructing cold-air ducts; "that said ditches were carelessly and imperfectly filled with frozen earth by the workmen in charge of that part of the work, and that the digging and filling of said ditches in that manner was carried on and persisted in by said workmen, with the tacit, if not the express approbation of the plaintiff, in spite of the defendant, and contrary to his express directions and protests." The evidence on these points was conflicting. The judge of the inferior court, at the instance of the counsel for the plaintiff, gave to the jury the following instruction:

"The jury are instructed, as a principle of law, that if a person employs an architect to draw plans for him, and superintend the proper erection of buildings, and such architect is made the superintendent in the contracts between the owner and the contractors, it is the duty of such architect to exercise proper skill and care in the superintending of such buildings, and such superintendent should issue no certificate to any of the contractors, unless such work appears, upon a proper inspection, to be properly done, and to conform to the requirements of the respective contracts, plans and specifications, unless otherwise directed by the owner."

The case was appealed to the Appellate Court of Illinois, and the judges of this court commented upon it in the following language:

"The contract by which the plaintiff employed the defendant to act as architect and superintendent was not in writing, and the precise terms of said employment are not very clearly shown. The plaintiff testifies, in substance, that he instructed the defendant to draw up plans and specifications, and let the contracts, and he admits that these duties were satisfactorily performed. He further testifies that the defendant agreed to superintend the erection of the buildings, and see that they were put up right; but admits that the details of his duties were not discussed, and that nothing was said as to how much time he was to spend at the buildings, or what he was to do there, or what was to be his compensation.

"The contracts between the plaintiff and the various contractors and builders were in writing, and provided, among other things, that each contractor should do his part of the work and furnish the materials therefor, agreeably to the drawings and specifications made by said architect, in a good, workmanlike substantial manner, to the satisfaction and under the direction and of said architect, to be evidenced by a writing or certificate under his hand, and to be paid for as the work should progress; provided, that in each case the contractor should obtain a certificate from the superintendent or architect, who should in

"every case retain fifteen per cent from each estimate, such fifteen per cent to be paid when the building should be completed and accepted; but that no certificate should be issued by said superintendent and architect unless the material should be on the ground, and the work performed in the building. The right was reserved to the plaintiff to make such changes in the plans of the buildings as he should see fit during the progress of the work, and it was provided that in case of any difference of opinion between the plaintiff and contractors in relation to the contract, the work to be performed under it, or in relation to extra work, or to any alterations in the plans, drawings or specifications, the decision of said architect should be final and binding on all parties.

"The defendant, on his part, testified in substance, that at the time he was employed by the plaintiff as architect and superintendent, nothing whatever was said between himself and the plaintiff in relation to his duties in superintending the work on the building, and that he only undertook to give such superintendence as an architect usually gives; that by universal custom among architects throughout the country, the employment and duty of an architect in superintending the erection of a building consist in acting as a general adviser, director and interpreter of the plans, and in most cases as an umpire; that he must stand ready to answer questions, and if any defect be called to his attention he must give directions to have it remedied; that he should see the bottom of the excavations before the foundations are put in, but that the number of visits to the building, and the times of making them, are left to his judgment; that, as the work progresses, if anything is brought to his attention by the owner or contractor, or by personal observation, it is his business to take proper steps in relation thereto, and notify the contractor; that before issuing certificates he should visit the building, and see how much work had been done; and before issuing his final certificate he should examine the work, but only so far as can be seen without tearing anything down; that if there is anything to excite his suspicion, he is to withhold his certificate until the objection is removed, or adjusted by money differences, it being sometimes impracticable, where inferior work is done, to get it removed, and in such cases settlement must be made by deducting for inferior work; that on important buildings it is usual to have constantly at the work an overseer employed by the owner, acting under the directions of the architect, but that it is not usual to employ such overseer on such buildings as those in question in this suit."

The Appellate Court said that, the nature and extent of the architect's duties being in controversy, he was undoubtedly bound to exercise reasonable care and diligence in the performance of his duties, whatever they were; but what they were was a question of fact, and not of law. Hence, the instruction to the jury was erroneous. Without directing the jury to pass upon the controverted question of fact, and determine what amount of care the defendant bound himself to bestow upon the work, it said that he was bound "to exercise proper skill and care in superintending the buildings," virtually leaving the whole matter of what it was "proper" for the defendant to do to the judgment and caprice of the jury, unrestrained by the evidence in the case. "The jury, being wholly without a guide in the matter, may have been of the opinion that 'proper' care involved the necessity of the defendant being constantly present as the building progressed, or of performing many acts which were entirely outside the purview of his employment as shown by the evidence."

The instruction as to inspecting the work before issuing certificates was also wrong, as imposing a duty not imposed by the terms of the contract, and not contemplated by the parties. The judgment was reversed, and the cause remanded.

[To be continued.]

THE PAGODAS OF BURMAH.—Mr. James Ricalton, writing of the wonderful old ruins of monuments and shrines at Anuradhapura, the City of the Sacred Bo-Tree in Ceylon, says: "From the days of the mound-builders down to the Eiffel Tower, man has shown himself to be a monument-erecting being; the Christians have their cathedrals, the Mohammedans have their mosques, and the Buddhists have their shrine-tombs, designated differently in different countries as pagoda, tope, and dagoba. The pagodas of China are entirely dissimilar to those of Burmah, and the dagobas of Ceylon are quite unlike those in either country; yet all serve the one purpose of relic-sepulture. They are not altogether a thing of the past; they are still erected near the temples; but those of modern construction are small and unimportant when compared with those that have withstood biennial monsoons for two thousand years; even their half-buried ruins are stupendous."

¹ Vigeant vs. Scully, 20 Bradwell, 437.

AMERICAN CONSTRUCTION THROUGH ENGLISH EYES.¹—III.

THE MARQUAND RESIDENCE, NEW YORK.



House of H. Marquand, Esq.

THIS house is at the corner of 68th Street and 5th Avenue, New York, and is the largest of a group of three houses which are so designed that while being distinct they make a picturesque group; it is one of the most costly residences in New York, and compares favorably with and, perhaps, in some of its details and interior finishings exceeds the excellence of the Vanderbilt houses. The plan is oblong in shape, consisting of a large central hall with balustraded gallery in tiers and lighted from the roof. The rooms being placed on all sides of the hall and communicating with it on the ground-floor and with the galleries on the upper floor. Each room is treated in a distinct manner, and all are carried out in excellent taste and workmanship. The staircase is of solid oak, with well designed newels and balusters; the balconies to galleries being all of the same material and corresponding detail. The ceiling of the drawing-room is the work of Sir F. Leighton; the piano-case, chairs, etc., being designed by Mr. Alma Tadema, the materials used being ebony and ivory with inlays of various other hardwoods in delicate scroll-work and heraldic devices.

The conservatory, which opens out of the drawing-room, is supplied with fountains and is paved with colored marble, the side walls being of a light-colored Sienna marble, and portions of the facings in the panels, etc., of Mexican onyx.

The dining-room is treated with oak panelling, some of the panels being filled-in with old tiles of Spanish, and other designs, the fireplace being entirely formed of these beautiful colored tiles fixed with bronze angle-irons, etc., and the backs and sides of fireplace of cast-bronze with bas-relief figures. Most of the walls are covered with rich, old, embossed leather as a filling, and the hall and corridors are lined entirely with tapestry of exquisite design. There is some excellent stained-glass about the building and also pictures, the works of both ancient and modern artists.

The corner and most of the Fifth Avenue front are occupied by the conservatory, which has an iron roof glazed with stained-glass, the

leaded lines of which are gilded on the inside. Above the conservatory, the roof is cut away and the space is partly filled on the second floor by a small extension, the balustrades connecting with a corner balcony. The main façade is broken up with two slightly projecting towers of different sizes, breaking through the lines of main cornice.

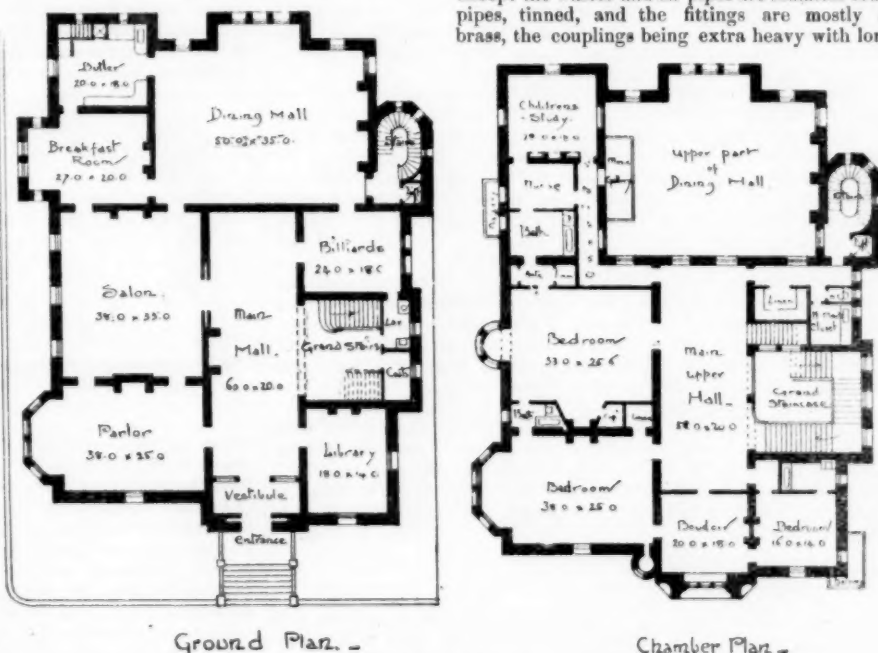
The building is three stories in height, besides the rooms actually in the roof-space which are lighted by dormers. The materials used in the exterior are red brick and brown-stone. The basement is rusticated, the rest of the stone-work being ashlar-faced. The chief dimensions are 60' by 125'.

The style of architecture of the exterior is transitional, of the period between late Gothic and early Renaissance. The parlor is finished in Pompeian style of decoration, the "den" in Moorsque, and the main hall and other principal rooms in French Renaissance, except the living-room, which is treated entirely in Japanese style.

The water is supplied from the Croton main, and is connected by two pipes, one being for direct service and the other to supply the hot-air engine which forces the water to the tank at top of the house for a high or indirect service. These pipes are of drawn tinned-brass. All the cold water distributing-pipes, either from street or tank, are brought to the cellar ceiling, from which they are suspended, and from thence run to their respective rising-mains. The Croton-supply pressure being insufficient to reach the third story, all water at that level is from the tank-pipes. The second-story water is supplied from either of the two systems with at every line the means of changing entirely from one system to the other, or vice-versa.

In the kitchen are two boilers of a vertical cylindrical form, and are respectively known as the "Croton" and "tank" boilers. The Croton-water pipe is taken from the general cold system in the cellar, passing through the floor of the kitchen and enters the boiler at the top. The "tank" water-pipe comes through the floor from the tank main in the cellar and likewise enters the boiler at the top. Between these two boilers is fixed a pipe connecting the two risers, each furnished with a stop-valve and check-valve, the object of this pipe being to allow water to pass from the Croton pipe into the tank pipe and thence into the tank boiler, should the water-supply from the tank be at any time disturbed or should the tank run dry. The passage of the water from the tank pipe to the Croton pipe is prevented by the check-valve which opens upward, and is kept in its proper place when water is in the tank, by the great pressure. There are separate water-backs and draw-off connections to each boiler. All the pipes except the wastes and air-pipes are seamless brass pipes, tinned, and the fittings are mostly of brass, the couplings being extra heavy with long

except the wastes and air-pipes are seamless brass pipes, tinned, and the fittings are mostly of brass, the couplings being extra heavy with long



House of W. K. Vanderbilt, Esq.

threads and all nickel-plated. The sinks used are of white porcelain, supported on cast-brass frames with turned legs. The slabs back of the sinks are of reddish gray Tennessee marble.

The kitchen-range has a large brass-framed hood fixed over it, and underneath is a large register opening into a flue parallel with the range smoke-flue, which latter warms it: the hood is lined with light-colored tiles made to match the walls of the kitchen, which also are finished with tile facings, the tints being neutral.

¹ Continued from No. 815, page 88.

The walls of the laundry have white glazed tiles with a border around ceiling. The wash-trays, six in number, are of porcelain, fitted up in two groups. The drying-room is fitted with eight drying-horses, each eight feet long and eight feet high, and provided with suitable wooden bars for hanging clothes; the bars or rails are arranged in pairs, the top edges of all being rounded. They are framed in whitewood and mortised into the front and back boards and fastened with rail bolts, the nuts being embedded in the bars. The track and frame on which these slides travel are of ash, suspended from the ceiling by bolts screwed to the joists. The jambs and panelled ends are of similar material, the handles being of bronze. No iron is used in the framing and rubber bands are fixed on the runners to prevent noise. The ventilation is arranged in the upper part of the drying-chamber, through a brick flue extending to the roof, the fresh air entering at the floor level under the heating coil.

The drainage system adopted in this building is that approved by the Health Department. The house sewer has a siphon at the area wall and a vent taken from near the curbstone; there are separate traps for every fixture and vents for all traps with back-air lines from trap-vents extending above the roof; separate drains are used for rainwater leaders and the area cesspools which discharge into a trap on the Madison Avenue side. All the soil drains and back-air vents are made of heavy cast-iron, and were subjected to close examination before being dipped in tar and tested, when fixed in position, by filling the entire system with water, the horizontal lines in the basement receiving a pressure of twenty pounds to the square inch, this pressure decreasing in ratio of one pound per square inch to about every twenty-seven inches of height in the vertical piping. No pipes are laid underground or hidden, but are carried on ledges or on brick piers and iron cradles.

THE RESIDENCE OF MR. W. K. VANDEBILT, NEW YORK.

This handsome structure occupies the northwest corner of Fifth Avenue and 52d Street. It has a frontage on the Avenue side of 100' and 125' on 52d Street. The building is executed in limestone and treated in the earlier period of the Renaissance style of architecture. The main feature in the Avenue front is the entrance doorway and the gable over flanked with a *tourelle* on the upper stories. The entrance doorway is an elliptically-shaped arched opening with pilasters at the sides supporting an enriched cornice, over which is a balcony with niches in the two splayed sides, the central part being filled-in with a solid balustrade. The whole of this portion of the elevation, as well as the turret, is richly carved, and the dormer-window terminating the composition on the Avenue side is made an important feature by the introduction of stone flying-buttresses. The richness of the design is much enhanced by the careful distribution of the ornamentation and the occasional breadth of plain wall-surfaces: on either side relief is gained only by small moulded string-courses at window-sill levels, the window jambs are carved and the mullions left plain.

The roofs are covered with blue slates and finished at the ridges with tall copper ridge-cresting and well proportioned finials. The chimneys are varied in design, each stack being different in plan or section from its neighbor, with pleasing effect.

The front entrance doors are executed in panelled oak and furnished with heavy bronze hinges; the doors are, however, designed to slide into a space in the thickness of the walling, an arrangement which affords a more convenient vestibule. The latter, with the entrance-hall and principal stairway, are finished in Caen stone, the dado being seven feet in height and carved. The ceiling is in quartered oak, in panels. The parlor is designed in the style of Francis I, with walnut wood ceiling. The *salon*, in the style of Louis XVI, is finished in gold and ivory. The dining-room, which occupies two stories in height, is in the style of Henri II. In this room the wainscoting is of wood, seven feet high, above which is a wide border of tapestry, hanging from the carved stone wall-surface, the stonework being designed as a frieze to the upper part of the room. In the dining-room screen, opposite the principal entrance, is some rich stained-glass representing events in English history.

The library is executed in ebony, and the furniture corresponds.

There are many other interesting details in this mansion, but it is not my intention to describe them herein. I merely touch the general points in the design of the building as a comparison with the Marquand residence, which although not so large a block, is equal in almost every respect in design, composition and execution, and of a more recent date.

A. A. Cox.

[To be continued.]

SUBSTITUTE FOR PLATINUM.—Word comes from Vienna that a Captain Walter has discovered a method of amalgamating glass with other metals besides platinum. This discovery will enable manufacturers of electric lamps to make them at a cost much less than at present. The platinum wire used in the construction of the bulb is the most expensive part of the lamp. One reason why platinum is used is that it has nearly the same rate of expansion as glass. Changes of temperature cause both to change bulk at nearly the same rate, so that if the platinum wire once fills the holes through the glass it always does so, and thus prevents the inrush of air, which would be fatal to the life of the carbon filament. It would seem, then, that Capt. Walter's discovery will enable copper and other metals to fulfil this condition.—*Light, Heat and Power.*

ANCIENT ARCHITECTURE FOR STUDENTS.¹—XII.

PERSIA.

CHRONOLOGICAL TABLES.

	B. C.	B. C.
Cyrus.	558	to 529
Cambyzes (Son of Cyrus).	529	to 521
Darius (Palaces of Persepolis).	521	to 486
Xerxes (Ahasuerus of Esther).	486	to 465
Artaxerxes (2d son of Xerxes).	465	to 425
Xerxes II (Son of Artaxerxes).	425	to 424
Sogdianus (Stepbrother of Xerxes II).	424	to 423
Darius Nothus.	423	to 404
Artaxerxes Mnemon (II).	404	to 364
Artaxerxes Ochus (III).	364	to 338
Arses (youngest son of Artaxerxes III).	338	to 335
Darius Codomannus.	335	to 330
Invasion of Alexander the Great and destruction of the Empire.	330	



Stone Base at Hamadan.

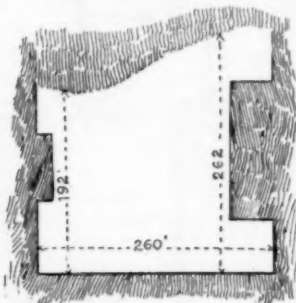
THE Persian Empire, one of the greatest and most magnificent the world had ever seen, although bearing sway over a very vast territory, had but an existence of 228 years. The Persians, originally inhabiting a mountainous district, were naturally enured to hardships and privations such as develop courage, manliness and activity. Descending from their fastnesses and settling in the lower country, years of indulgence and luxury wore out their natural characteristics, and, like other Oriental nations, they lost their powers of self-defence, and fell easy victims to the first invader.

The empire extended from nearly the centre of India, on the east, to the westernmost parts of Asia Minor on the west, and from the south part of the Gulf of Persia to latitude 45° north, a point east of the Aral Sea. Greece, the Aegean Islands, Asia Minor, Persia proper, Turkestan, Afghanistan, Beloochistan and part of India were all included. Egypt and the north of Africa were added in the days of Darius. The Persians, with their hordes, were kept busily engaged for many years subduing and keeping down their more turbulent subjects in the extremity of their domain.

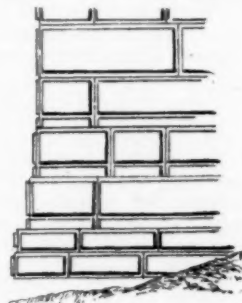
Cyrus, the conqueror of the Medes, was the son of Cambyzes, a prince of Persia, who, conquering their King, Astyages, united Persia and Media (or Babylonia) under one rule. He came to the throne 558 B. C., and reduced Babylon, as we have seen, 538 B. C. It is with this man that the history of the empire really commences.

Persian architecture is remarkable for its simplicity and the grand effects produced by the simplest means. The stiffness of its simplicity is lost in the proportions of the detail. In their plans, only the straight line and the right angle are used. There is no great regularity in the spacing out of the columns, the positions of doors and windows, etc., and there is a charm about the solidity entirely lacking in the works of the Assyrians and Chaldeans.

Persia is particularly interesting for two reasons. Not only has Persia so close a connection with the familiar history of the Old Testament, but it is here that columnar architecture, the germ of



Platform at Passagadae.



which began to sprout in Egypt, and which has flourished everywhere since, was actually developed, and the column was brought from the position of a decorative feature to be a structural necessity.

Persian columns bear the stamp of a wooden origin, undoubtedly derived from the Medes, who inhabited the well-wooded hills of the Zagros range, and constructed, during their brief career of prosperity, edifices of considerable magnificence, and in which the wooden pillars were the principal features. Through the many expeditions to Egypt, the Persians brought therefore from the column to use it in the manner suitable to the material they wished to employ, for Persia is sparsely wooded, while stone is in abundance.

Palaces and tombs afford the best examples of Persian architecture. Their religion was so simple in its tenets that there was little scope for the development of art in temples or other religious establishments, so that their efforts were concentrated on the comfort and magnificence of display to be enjoyed in this life, while they at the same time prepared tombs for the reception of their bodies after death. Their religion was Buddhism, the worship of the two principles of good and evil, united with the Medean magism, or worship

¹Continued from No. 816, page 104.

of the elements. Such a religion was eminently conducive to luxury and sensuality, which gradually, by its effeminating influence, overcame the better qualities and characteristics of the hardy race from which they sprang.

Like the Assyrians and Chaldeans, the Persians raised their cities on platforms, but the immense Persian platforms were of stone throughout, instead of brick, and they remain to this day.

At Persepolis, at which place are situated most of the principal buildings, the platform rises about twenty feet above the plain, and is of solid masonry, faced with very large stones, hewn and clamped together by iron clamps let into sinkings on the surface of the stones prepared for them.

One of the characteristics of Persian architecture is the great staircases by which the top of the platform is reached from the plain, and the upper levels from the lower levels of the platform. There are at Persepolis two principal flights of stairs, one from the plain and the other from the main platform up to the Hall of Xerxes. They were very wide and of easy ascent, so that without difficulty horses could be ridden up and down them. The principal staircase, that from the plain to the lower level of the platform, consists of two distinct sets of stairs, each in two flights, the steps placed at right angles to the walls of the platform; standing on the platform, and facing towards the plain, a visitor has the two upper flights diverging to his right and left. They terminate on a landing half-way down, and from this landing the lower flights converge again towards the centre. The rise of each step is only four inches, and the whole width of each flight is 22 feet. No doubt, these were designed not merely for convenience of access to the platforms, but also for special display of magnificence, and we can well imagine the splendid effect of a great procession, regal or religious, under the auspices of Zoroaster, the great religious leader and reforming priest. Approaching to the top of the steps, the procession separated right and left and descended the first flights, and then converged towards the centre as the level of the plain was reached, marching to the sound of martial music, each horse gorgeously caparisoned and his rider richly robed, the brilliant colors and the gold and silver ornaments flashing in the southern sun.

But the staircase that ascends from one platform to the other is much more singular. The lower flights, instead of starting together and diverging, commence at a considerable distance apart, and converge as they ascend to a platform about 20 feet wide, at half the height of the whole staircase; from this landing, at a distance apart of 63 feet, start the upper flights, two separate and distinct stairs, diverging and rising to the summit of the upper platform. The entire face of this staircase is covered with sculptures, animals and men, and the builder, Xerxes (the Ahazuerus of Esther) meant to have made this a monument of his famous expeditions against the Greeks and other nations, inscribing panels, left blank for the purpose, with accounts of his deeds. But this notion was not carried out, for in only one panel has the inscription been cut which acquaints us with the fact that this staircase was built by Xerxes. From outside to outside this staircase measures 212 feet. Another staircase is of interest because it faces the platform, instead of being sideways or at right angles to it, as the two principal ones are.

The palace of Darius, erected 521 B. C., was approached by a staircase in front of a portico of eight pillars in two rows flanked by chambers or guard-rooms 20 feet by 30 feet, which opened only into the portico. Behind the portico and entered by a doorway in the centre, was a square hall 50 feet by 50 feet, of sixteen columns of four rows of four. Only the bases however, now remain. The walls of the hall were five feet thick (according to Flandin), ornamented on three sides of the hall with niches and doors, while two windows on each side of the entrance doorway looked out into the portico. The wall on the right-hand side (on entering) had one doorway, almost in a line with the second row of pillars, communicating with a suite of four rooms. The rest of the wall-space contained two niches on one side of the door and one on the other.

The back wall contained two doorways communicating with a hall behind, which doors were visible along the first and third avenue of columns, while in the intermediate spaces were niches. The left-hand wall was originally of a similar arrangement to the right-hand, but Artaxerxes, 465 B. C., turned the last of the four rooms on this side into a vestibule, altering one niche into a door and placing a door in the outer wall, and here he built a double flight of steps down to the level of the platform. The curious have speculated upon the reason for this alteration, and all kinds of ideas and theories have been put forward, but Rawlinson settles the matter by the suggestion that it made a shorter way to the house of the women. This whole building occupied an area of 135 feet by 100 feet.

Nothing could be more magnificent than the "great pillared halls," of which there are two examples at Persepolis. One known as the "Hall of 100 columns," consisted of a great chamber, 227 feet each way, — area 51,529 square feet, with ten rows of 10 columns each, 20 feet apart and 35 feet high. It was approached by a portico of two rows of eight pillars of the same height as those inside, and flanked right and left by guard-rooms measuring over all, portico and guard-rooms, 183 feet by 52 feet. The hall was surrounded by walls 10 feet 6 inches thick, in which were doorways opposite one another between the rows of columns; the rest of the wall-space was occupied with niches, of which there are three in the spaces at the side of the doors, finished in the manner all such niches are finished in Persian architecture, flatheads with the usual orna-

mentations. On the side against which the portico abuts, the places of the niches are occupied by windows. One point in this building is noteworthy as it is exceptional, and that is that the portico and guard-rooms do not take up the entire width of the hall and its walls, but are 44 feet narrower, leaving a space of 11 feet at each end. This building was probably a hall of state ceremonies, as the ornamentation represents attendants in service upon the king, who is also represented killing strange animals, banqueting, or on his throne with his guards about him. One set of carving on the doorway shows the king seated on his throne, upheld by figures in three stages, representing the nations over which he ruled. The great staircase approaching this hall is decorated with figures of men bringing tribute and presents. How light was admitted to this hall, and others similar to it, is a question not easily answered; its size would require a considerable area of windows even without the columns, which would throw such shadows. On three sides there were no windows only niches, and it is clear that there could not have been sufficient light from these and the doors. Flandin suggests there were apertures in the roof or it may have been that the walls above the top of the doors and niches were pierced with windows, as Rawlinson remarks, and as it is represented on some bas-reliefs, but we have no information on the subject and none of the ruined walls stand so high.

But the most remarkable building of all the ruins of Persepolis is one of the greatest interest also. It had no enclosing walls. It consisted of pillars only, in four groups. The largest group, the central one, as it may be called, had thirty-six pillars, equidistant, and forming a square of six rows of six, occupying an area of 20,000 square feet. On three sides of this and 70 feet distant, are other groups, like porches, of twelve pillars each, in two rows of six pillars, each group measuring 30 feet by 140 feet, and entirely disconnected from the others. Fergusson very ingeniously arranges walls for this building, enclosing the central group and making the other three groups porticos to the "central" hall, but there are many obvious reasons against this theory. First of all where have the walls gone to, for there are no mounds of rubbish that would account for them. In the place where the wall might be, midway between the central group and one of the porches, are four bases, 17 feet long back to front, and 5 feet 6 inches wide on the face. They are too far apart to be jambs of doors, the general width of doorways being not more than 13 feet, and except for these there are no signs at all of any other erection in the lines where the walls would be. It is possible they may have been the bases for statues or winged bulls as is suggested by Flandin, but perhaps, as Rawlinson says, it is best to confess at once that we do not know the uses of these strange foundations. That they were not openings in walls is certain, for in the very lines that Fergusson puts his walls, there are existing to the present day, surface drains. We are forced to the acceptance of the theory which is so well upheld by existing facts, that it was what has been called a "Summer Throne Room,"¹ or better still, "The Court of the Garden." We have in the book of Esther a description very suitable to such a building as this. This very "hall" under consideration was built by Ahazuerus (or Xerxes as he is known more generally in history), similar to his building at Susa (or Shushan), — where "the king made a feast unto all the people that were present in Shushan the palace, both unto great and small, seven days, in the court of the garden of the king's palace,"² where were green and blue hangings fastened with cords of fine linen and purple to silver rings and pillars of marble." And the account goes on to relate that Vashti, the Queen, made a feast to the women in the royal house. A distinction is made between the "court of the garden" and "the royal house." A court with pillars to which curtains could be fastened seems to answer the description of this building at Persepolis.

The height of these columns is 64 feet and is unusual, and the form of the bases of the portico is very beautiful and singular, "bell-shaped, ornamented with a double row of pendant lotus leaves, some rounded and some narrowed to a point."³ The columns are graceful, tapering slightly, but with no entasis, and all the shafts are fluted from top to bottom, with from 45 to 62 flutes to each column.

The central group of pillars had no bases; it is supposed that there was a floor raised to the top of the two steps on which each column stands, in which case the shafts would rise direct from the floor without base.

The caps of the side group of pillars are simple double griffins, those of the western being two half bulls, while those facing the great staircase are of three distinct members, lotus bud and pendant leaves, then volutes, and above these bulls like those to the western porch.

Loftus very carefully examined the ruins of the similar "court of the garden" at Susa, but could find no trace of walls, and the only apparent difference between this building and that at Persepolis, is that at Susa there was no staircase of approach.

Forty-nine miles from Persepolis was another great city of the Persians, called Passagade, but of it very little now remains except the platform on which the palace stood. It measures 260 feet by 262 feet at its widest parts, and 192 feet wide at its narrowest. Its form is peculiar, for it follows on one side the line of the brow of the hill on which it is situated. The masonry of this platform is of immense stones, dressed smooth on the face, but with a margin sunk

¹ Rawlinson.

² Esther 1: 5, 6 and 9.

³ Rawlinson.

all round against the joints and angles, similar to the masonry found at Jerusalem and sometimes in Greece. The remains of a column still *in situ* consist only of a base, described by Rawlinson as being in form a semicircular bulge ornamented with a series of nine flutings.

Many Persian palaces have in connection with them lofty buildings situated so as to command the approaches. They are usually square on plan and the roof is supported by four columns. Such a building is mentioned in the Book of Esther—the "Gate" where Mordecai was wont to sit at Shushan. It is possible they were used as guard-rooms, but their probable first use was that of judgment-halls.

The largest of these halls, of which there were four in all, on the platform has an internal area of 82 feet square; four lofty columns support the roof the exact height of which is uncertain, but it is somewhere in the neighborhood of 50 feet.¹ Two grand portals lead into this apartment, flanked with colossal bulls, those towards the staircase being conventional representations of the real animal, while the opposite pair are almost exact reproductions of the winged and human-headed bulls with which the Assyrian discoveries have made us so familiar.

Near the Palace of Darius was another of these halls, the only remains of which are the bases of two of the columns and three doorways, occupying positions in the centre of three of the enclosing walls. It is inferior in its dimensions to the first mentioned.

A third hall is smaller still and only the bases of four columns remain, while another hall is so ruined that its dimensions cannot be easily ascertained.

It seems strange that the Persians who were so proud a race and so vigorous in the execution of their great works, should have contented themselves so absolutely with the development of columnar architecture to the exclusion of other forms of the art. We have very few examples of anything else in the way of their decorative works than bas-reliefs. No statuary and no carvings have been found, their only attempts at imagery being the colossal bulls borrowed from the Assyrians.

(To be continued.)



QUITE unintentionally we have laid before our readers this year an unusual amount of matter bearing on Spanish architecture. We do not mean to apologize for so doing, for we feel that the information so given cannot but have been both useful and interesting, and now that we have to speak of the fifth part of Max Jung-handel's very admirable publication,² our only regret is that we cannot lay before our readers a dozen or so of the interesting subjects he has selected for illustration. For instance, here is an interior of the Sala de Reposo del Baño, in the Alhambra, after an oil-painting by Felix Possart, which has been most effectively reproduced by chromo-lithography. It would take an expert to discover how many "printings" had been needed to produce this rich and harmonious result, which has all the depth and tone of an antique Persian rug. Yet when the next plate proves to be another chromo-lithograph, showing in repulsive brilliancy of red and gold and blue some of the colored decoration in the same building, drawn with the faithful realism of the architectural draughtsman, one cannot but feel that M. Possart drew not from nature but from imagination while producing his charming painting.

These two are the only colored plates in this Part: all else are gelatine prints, both of exterior and interior details and whole subjects, and yet comparatively few of them have been mentioned in the several papers touching on Spanish architecture published this year, and in this give proof of the great variety and interest of the material the traveller can find in Spain.

Nothing is more interesting than to note the author's practice in the matter of division and classification of styles, a classification which is often not a very obvious one nor, when made, at all certain to meet the approval of the observer.

No one would dispute that Baroque was the proper and only term to apply to the extraordinary treatment of the doorway and windows of the Casa de dos Aguas at Valencia, where the wanton vagaries of the nightmare-haunted stucco-worker have produced the most extraordinary combination of contorted and convoluted forms. But one is a little inclined to disagree as to the division between Renaissance and Plateresque work, until it is noted that the author considers that Renaissance is to be applied only to close reproductions of Roman forms and ordonnances, such as are to be found in the Escorial and the Royal Palace at Madrid, where pier and column, entablature, pilaster and arch are employed to produce an artistic effect through constructive methods alone, without calling upon decorative sculpture for those more gracious and pleasing applied accessories which are generally associated with Renaissance architecture by those who have seen it at its best in Italy and France.

These applied decorations induce our author to class all buildings

to which they are attached in the Plateresque style, and the classification generally seems proper enough, for in Spanish specimens of the class there are usually introduced impure forms and lines which savor more of cast metal work than of hand-wrought stone. Yet there are examples which would be classed unhesitatingly, if found elsewhere, as Renaissance work. For example, we can find almost no detail in the plate which exhibits the staircase in the Archbishopal Palace at Alcala de Henares which might not have been used in the Palais de Chambord. On the other hand, the plate which discloses the blocked-up doorway in the same palace is called Renaissance work, although it repeats almost precisely the same forms that are to be found in the Sepulchre of Sta. Veronica in the cloister of the Cathedral of Léon, which the author describes as Plateresque. There is a subtle distinction between the two phases of what is practically one style which escapes us. It is not impossible that the author uses one name in lieu of the very vague but useful term "transitional," and is really guided in his ascriptions by ascertained dates rather than by positive architectural character. As to the propriety of ascribing to the Plateresque style the front of Santo Domingo at Salamanca, there can be but one opinion. Here is decoration *appliquée* without stint: narrow lofty pilasters decorating the faces of the great buttresses that enframe the entrance and sustain the great arch, these in turn supporting the candelabra-shaped colonnettes above, while between, upon the front wall, are order upon order of pilaster and engaged colonnette and between them culs-de-lampe supporting statues protected overhead by semi-Gothic canopies, and where these are not, there are roundels and bosses, sculptured friezes and panels small, and larger panels bearing great bas-reliefs of the Crucifixion and the Martyrdom of St. Stephen.

Upon the plain wall of what may be the end of the north aisle, perhaps fifteen feet from the ground, are to be seen the traces of painted capital letters which look as if they were brought out by the all-seeing eye of the photographic lens, which often sees the invisible. In this place the letters seem as if they may have once formed part of some inscription, but another plate which shows the façade of the Archivo at Salamanca, shows practically the whole of the plain walling occupied with traces of great Roman capital letters of varying sizes, and mostly consonants, which do not seem ever to have formed consecutive words or recognized abbreviations of any language known to us. Perhaps some one can tell us what DGSPADRYA means, and why this wall has been so befuddled with letters worked or painted one set upon the top of an older set seemingly and covering the wall up to a height of, perhaps, thirty feet. If it is a take-off upon the Moorish habit of decorating buildings with quotations from the Koran, it is not a success.

This Part is worthy of as much careful examination as those which have preceded it.

MR. ROBERT GRIMSHAW has a happy knack of using what he calls "plain United States," which makes the several little hand-books on mechanical subjects which he has published not only easy but easily digestible reading. It does not take many minutes to read one of them from cover to cover, but it does take a good many minutes to make his statements, so plainly put and so evidently indisputable in most cases, one's permanent mental property.

Perhaps the publication of most use to architects of those he has prepared, was his "Pump Catechism," and we were disposed to think that his latest hand-book, "Hints to Power Users,"³ would contain little of interest to the profession, but on the contrary there is much in it. Amongst other things he lays particular stress upon the culpable practice which owners and their architects have fallen into of placing boilers in ungetatable and ill-lighted vaults under the public sidewalks. "A common sixty-horse tubular boiler, full of steam and hot water at seventy-five pounds per square inch, stores 51,000,000 foot-pounds of energy, of which but four per cent is in the steam; and this is enough to drive the boiler just about one mile into the air, with an initial velocity of nearly 600 feet per second." When one stops to consider what this really means, one finds it really means a great deal, and that in a mile's walk along Broadway he has unknowingly put his life at hazard a hundred times by passing over a hundred boilers, any one of which might at any moment undertake to solve the problem of aerial navigation under the misguided inspiration of some self-taught "stationary engineer," who had tied down his safety-valve, or let his boiler-plates burn out, or his tubes choke up with scale, or, because his gauge was in a place too dark to read its indications, had let his water get too low, or had injected his feed-water incautiously or had committed some other excusable or inexcusable blunder. If the engineer escape with his life after an explosion he is blamed, discharged and left to starve, when it was not his fault that he, a third-class man, was through the parsimony of the employer, set to do a first-class man's work; and the owner of the building built with the intention of using steam-power in it, is not wholly to blame, for the architect who planned the structure should have insisted, in the face of all opposition, that the great heart and lungs upon which the commercial usefulness of the investment depended, should be housed in a spacious and well-lighted engine-room, where all parts of the engine and boiler could easily be kept

¹ Rawlinson, 50 feet to 60 feet; Ker Porter, 50 feet; Flandin, 54 feet; Ferguson, 49 feet, 6 inches.

² "Die Baukunst Spaniens" Part V. Brentano, Chicago, Ill., Sole agent for the United States. Price \$10 per Part.

³ "Hints to Power Users." Plain, practical points, free from high science and intended for the man who pays the bills. By Robert Grimshaw, M. E. New York: Cassell Publishing Company, 1891.

under constant observation. The architect cannot prevent an owner from employing a third-class man, but he can so arrange things that such a man may, by his surroundings, be encouraged to fit himself for first-class work, a step he will never think of attempting if his constant companion — which, if he be a man, he must in time grow to love — is housed in a cramped and dingy hole where he cannot perceive whether it is working with fevered pulse, or with the lethargic energy due to a choked and defective circulation.

The sections on boiler-setting, on choosing a boiler, on pipe-coverings, on kinds of engines, and those on water-power, wind, and gas engines, hot-air engines and electric motors may also be read with the expectation of deriving compact and useful information through their perusal.

ONE of the most excellent hand-books to keep in an office for the use of draughtsmen and pupils, is Mr. Morris's "*Geometrical Drawing for Art Students*,"¹ in fact every student should be urged to buy it, at the same time he fits himself out with his box of drawing-instruments. Not only does it give the demonstration for all the geometrical difficulties that a draughtsman is likely to meet in finding points, dividing lines and spaces and so on, but there are certain chapters which explain the construction of many of the geometrical decorative patterns and the simple forms of tracery which in these days, when clients are become more appreciative of architectural forms, a draughtsman may be called upon in a hurry to set out for a stone-cutter but may not know where to turn for a guide in determining his centres, or how to draw his tangential curves. The last part of the book is devoted to the discussion of the projections and revolutions of solids, and the work is interspersed with examples for the student to work out, though this part of the book could have been improved by casting the examples into the form of practical every-day contingencies which call for solution, rather than in the pedagogic form of abstract statements.

IF ever it should be necessary for an architect to determine the pressure which a retaining-wall of given form and structure can resist, we trust he may be within reach of some capable engineer to do the needed computations and not have to try to digest the complicated diagrams and formulas with which Mr. Howe's little book² bristles in most repellent manner. Sine, cosine and tangent appear at every turn and the greater part of the Greek alphabet is called on to do service for this most mathematical expounder of the theory of earth pressures.



[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

BUILDING OF THE AMERICAN TRUST, LOAN AND GUARANTEED INVESTMENT COMPANY, PHILADELPHIA, PA. MESSRS. BAKER & DALLET, ARCHITECTS, PHILADELPHIA, PA.

[Heliochrome, issued with the International and Imperial Editions only.]

RANDOLPH MACON WOMAN'S COLLEGE, LYNCHBURG, VA. MR. W. M. POINDEXTER, ARCHITECT, WASHINGTON, D. C.

CASINO AT MEYER'S LAKE, CANTON, O. MR. I. J. KNAPP, ARCHITECT, CANTON, O.

UNITARIAN CHURCH, TOPEKA, KAS. MR. SEYMOUR DAVIS, ARCHITECT, TOPEKA, KAS.

A PAIR OF DOUBLE HOUSES FOR JAMES S. JENNINGS, ESQ., DETROIT, MICH. MESSRS. HESS & RASEMAN, ARCHITECTS, DETROIT, MICH.

COTTAGE FOR MRS. J. E. CARY, NANTUCKET, MASS. MESSRS. HOPPIN, READ, & HOPPIN, ARCHITECTS, PROVIDENCE, R. I.

The house is to be built on the "Cliff" and of rubble stone brought over from the mainland; rough shingles, stained gray and white trimmings and columns.

[Additional illustrations in the International Edition.]

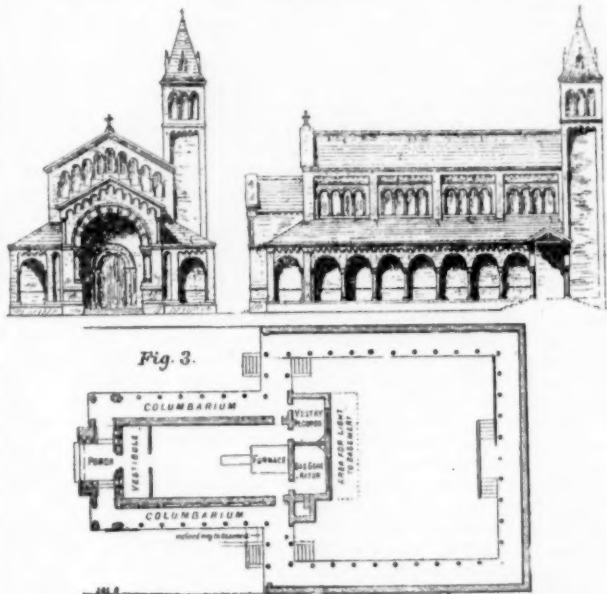
PLANS AND SECTION OF THE THEATRE AT TOURS, FRANCE.

If we examine the general distribution of the theatre at Tours, we find, at first view, the to-day's classical disposition of the foyer in the front of the building and the staircase-hall between the foyer

and the auditorium, as at the Opera-house in Paris. Here, in this case, the resemblance is still further increased by lateral staircases arranged in relation to the grand staircase as they are in the Paris example. The staircases for exit, are also placed in analogous positions. This portion of the building occupies about a third of the site; but one cannot find fault with the architects for having made such commodious arrangement for exit, which may become indispensable at any moment. The same reason has led to the introduction of very broad corridors at every story, where all the spectators belonging to that story may promenade at their ease. The hall and its dependencies occupy the second third of the plan, while the third portion is reserved to the stage and its dependencies, the actors' dressing-rooms, etc. In this last portion the means of exit and the staircases are somewhat cramped. It is to be hoped, however, that they will be sufficient for a rapid freeing of the stage, which, as a rule, is occupied by but a few actors at a time. Offices of the administration are found in this portion of the building, while, on the contrary, the storehouse for scenery is found in the front of the building.

THE MANCHESTER, ENG., CREMATORIUM.

THE disposal of the bodies of the dead, without injury to the living, is a question which is beginning to press upon the inhabitants of large towns. The existing suburban cemeteries are being filled very rapidly, while the growth of population is quickly causing the houses to flow up to and past them. In many places, burying-grounds that a few years ago stood quite isolated, are now completely surrounded with streets. The prospect opens that in the next generation funerals will always have to proceed by railway to some distant spot, chosen for its solitude and its distance from all towns and villages. In the face of recent discoveries into the causes of disease, and of those that may be expected during the next few years, the barbarous plan of filling a piece of town land with slowly putrefying bodies, to poison both earth, air, and water, will certainly not be permitted to be continued. How much of the epidemics of past ages were attributable to the pollution of the village pump by the picturesque churchyard, it is impossible to say, but the probability is that our ancestors were cut down by thousands from this cause alone. We know that the introduction of a very small quantity of the dejecta of typhoid patients into a water-supply will create a widespread outbreak of the disease, and if this be so, what must have been the effect of the drainage of a churchyard containing a



score or more of bodies completely filled with the germs of the disease? It is no mere imaginative theory that the underground water in the neighborhood of graveyards is contaminated. At the original Owens College in Quay-street, Manchester, it was a stock laboratory-experiment to demonstrate that water drawn from the well on the premises was heavily charged with nitrates from the adjoining churchyard. It is needless to add that no one thought of quenching his thirst from that source. It is to the existence of public water-works in all towns in England that we may attribute the easy toleration of urban and suburban graveyards. If we had been as dependent on purely local water-supplies as are many of the large towns of the Continent, we should long ago have taken more active steps to secure their freedom from pollution. On the Continent many epidemics have been traced to the use of wells contaminated by decomposed human bodies.

But by securing pure sources of water-supply we by no means eliminate all sources of risk from the decay of the dead. The air and the soil are both liable to be polluted by the emanations from the grave. In many places the sense of smell affords evidence of the presence in the atmosphere of the products of decomposition, and

¹ *Geometrical Drawing for Art Students.* Embracing plane geometry and its applications, the use of scales, and the plans and elevations of solids. By J. H. Morris. London: Longmans, Green & Co., 1890.

² *Retaining Walls for Earth.* Including the theory of earth-pressure as developed from the ellipse of stress; with an appendix presenting the theory of Professor Weyrauch. By Malverdi A. Howe, C. E. Second edition, revised and enlarged. New York: John Wiley & Sons, 1891.

Signor del l'Acqua, M. D., has stated that he has often seen carnivorous birds hovering over the cemetery at Milan, attracted by the odors of putrefaction that arise from it. The infection of the soil is still more serious. It is well known that a special cadaveric poison or ptomaine is developed in dead bodies, which has much analogy in its results with septo-pneuma. If air be drawn through a thin layer of earth taken from a cemetery, and then passed through test-tubes filled with a nine per cent solution of glucose, the poison becomes fixed. A small quantity injected under the wing of a pigeon soon produces serious symptoms. At the end of twenty-four hours the bird is taken ill; it develops a frightful diarrhoea and continual sickness, and in three days it dies. Similar results, but in a less degree, have been obtained from soil taken at a depth of twenty inches to twenty-four inches from a cemetery that has been closed for ten years.

In studying the subject of charbon or splenic fever in cattle, Pasteur found that earth mould contained the specific germs of the disease. In a field in the Jura, where a diseased cow had been buried two years before, at a depth of nearly two feet, the surface-earth not having been disturbed in the interval, Pasteur found that the mould contained germs which, introduced by inoculation into the guinea-pig, produced charbon and death. And further, that if a worm be taken from an infected spot, the earth in the alimentary canal of the worm contains those spores or germs of charbon, which, inoculated, propagate the disease. The specific organisms of yellow fever, malarial fever, and cholera multiply in the earth, and Sir Spencer Wells has pointed out that what is true of charbon may also be true of typhoid, small-pox, scarlet fever, and measles.

Science thus confirms the verdict of experience that it is unhealthy to live in the neighborhood of a graveyard. Unfortunately, large numbers of the population have very little choice in the selection of their dwellings, and must live where they can, or where their business lies. It, therefore, devolves on the sanitary authorities of the future to see that cemeteries shall be located in lonely neighborhoods where there is no probability of population congregating, or else to encourage a method of disposal of the dead, in which putrefaction shall have no part. This latter result is attained by cremation, a plan which is already in constant operation on the Continent, and which has many earnest and able advocates in England. It is no part of our business to weigh the arguments—sentimental, religious, sanitary and judicial—which have been urged for and against the destruction of dead bodies by fire. But as an example of what can be said in its favor we give a very brief abstract of part of a paper on the subject, read by Mr. A. Emrys-Jones, M. D., at one of the Manchester Health Lectures for the People.¹ The practice of cremation is very ancient, but the English society was not founded until 1874, and the first cremation did not occur until 1879. From that time until the date of the lecture, twenty-three bodies were cremated at Woking. It was, however, not until 1884 that the legality of the operation was judicially affirmed. The movement arose in Italy a few years earlier than here, and between 1877 and 1886 there took place 788 cremations in Milan, Rome, and other cities. There are, in Italy, thirty-one cremation societies, and similar societies exist in nearly all countries. As to the religious objections brought against the practice, the lecturer quoted the late Bishop Fraser, who said, "No intelligent faith can suppose that any Christian doctrine is affected by the manner in which, or the time in which this mortal body of ours crumbles into dust and sees corruption." The present Bishop of Manchester said, "Of the two modes" of burial "proposed, cremation was the more Christian. They certainly had no basis to encourage the degrading superstition that every particle of matter that was buried in the grave would be raised again." The late Earl of Shaftesbury said, "There is another argument urged on religious grounds—that it will annihilate all hope of a resurrection. What then will become of the thousands of blessed martyrs who have died at the stake in ancient and modern persecutions?" Another objection, said Dr. Emrys-Jones, was that the practice was revolting to the senses, and he proceeded to correct this by a description of a well-designed crematory, showing that it emitted neither smell nor smoke. The objection that carries the greatest weight with many that find no difficulty as regards the sentimental and the religious aspect of the case, is the medico-legal one, that is, that if cremation be adopted cases of poisoning may go undetected, and the perpetrators escape punishment. Sir Henry Thomson has dealt with this aspect of the case, pointing out that the chances of detecting poison after burial is very small. All traces of the most potent poisons, such as morphia, aconite, atropine, strychnine, and prussic acid, are rapidly decomposed, or soon become unrecognizable, so that only three poisons—arsenic, antimony and mercury—are capable of detection after a considerable period. As there were, in 1884, no fewer than 20,194 persons buried in this country without any certificate of the cause of death, it cannot be said that cremation would render the probabilities of a poisoner's escape much greater than it is already.

A journey was, last year, made by Mr. Henry Simon, chairman of the Manchester Crematorium, Limited, to inspect the principal crematories of Europe, in order to gain information to be used in the erection of a similar structure in Manchester. From notes which he has published on the subject we learn that at Woking the flames

from a coal fire are led, on their way to the chimney, over the body to be burned, and then across a second fire of coke to consume all odors and appearance of smoke. The time of heating-up is 1½ hours, and the cremation is effected in a similar time. At the cemetery of Père Lachaise, the Parisian authorities have erected a large and expensive crematorium. The furnace is by the side of the waiting-room; the coffin is placed on an iron tray, which serves to receive the ashes, and from which they can subsequently be collected. The building is one of considerable architectural pretensions, and no expense has been spared. The crematorium at Zurich has been constructed on the plan of M. Bourry, of Paris. The furnace may be compared to a gas-retort or a coke-oven constructed of firebricks. The combustion is effected by gas from a producer-fed with coke. This gas is first used for heating both the inside and the outside of the furnace, but during cremation the gas is burned exclusively outside the furnace. The products of combustion pass through a regenerator to heat the air. The body itself is caused to burn by radiation from the walls in an atmosphere of hot air which is passed over it. The furnace stands in a hall, and is in the shape of a monumental sarcophagus, the exterior shell of which does not become heated. The coffin is placed on a table in front of the furnace during the reading of the service, and then by a mechanical device, without visible handling, a door opens, the coffin slides inside, and the door closes. In less than two hours nothing remains but a few handfuls of ashes. Mr. Simon also visited other institutions of the same kind in Dresden and Milan.

The object of Mr. Simon's journey was not only to collect information as to what should be done, but more particularly, we should imagine, to learn what should be avoided. The Anglo-Saxon feeling of reverence for the dead is so great that no new system of burial will ever become popular that does not respect it to the utmost. Not only must all legitimate demands for decency and propriety be met, but even the prejudices of the ignorant must be considered. In the Continental crematories there are several features that would not be tolerated here. For instance, in Italy the bodies are introduced into the furnace nude and without coffins. In some places the heat of the fire is felt in the room or chapel where the service is read, and occasionally the flames are seen belching forth when the doors are opened for the reception of the coffin or tray. Such scenes are very trying to the nerves, and compare badly with the quiet and solemnity of the grave, owing to the fact that we never allow our imaginations to contemplate the process of dissolution which follows after the earth has been filled in, and the green sods restored to the surface. If the practice of cremation is ever to become popular here, it must not betray itself to the senses of the mourners, more than does the slower reduction to dust and ashes which takes place in the ground. There must be neither the sound of flame, the sight of smoke, nor the feeling of heat in the chapel. The coffin must enter as if into a vault, and then, after sufficient interval, the ashes must furnish the only evidence that the other elements of the body have been returned to the atmosphere, purified by fire.

The task of designing a furnace that will fulfil these conditions has been undertaken by Mr. Simon and by M. Bourry, and has been carried out in the way shown on the plate reproduced from *Engineering*. It is being erected on a piece of land that lies on the Chorlton side of the Southern Cemetery on the Barlow Moor Road, near Manchester. It will thus form, as it were, a continuation of the cemetery, and will appear as part of it, ready to be actually incorporated with it, if this should ever be desirable. The plans for the building have been prepared by Messrs. Salomons and Steinthal, of Manchester, and as our illustrations show, provide for a hall or chapel containing the furnace, with open columbaria for the reception of the urns and memorial tablets. The hall will be about 50 feet long by 25 feet wide, and of proportionate height. In the centre of one end, against the wall, will be placed the furnace, concealed in an ornamental marble shell. The hall will be flanked on either side by open arched colonnading raised three feet above the ground level, forming a columbarium, the recesses for the urns being made in the extension of the walls of the hall. Spaces for urns will also be provided in the walls on the inside of the hall. It is further intended to sell the ground, similarly to what is now being done in cemeteries, for the establishment of private or family vaults containing a number of urns of the same family. In the cemetery of Milan such family vaults, some of them arranged along the wall of the cemetery or in the open, offer an appearance quite approaching the monuments in ordinary cemeteries. Should more wall surface be required for this purpose in the future, this colonnading will be extended (Figure 3), forming open cloisters to the rear of the building. The style of the building is Romanesque; it will be erected in sandstone, with red tiled roof; the tower will contain and hide the furnace chimney.

Turning to the detailed drawing of the furnace, it will be seen that the method of working entirely by gas, which is customary on the Continent, is only partly adopted here. This is not because it is not conceded that gas firing has much to recommend it, but from the fact that it is extremely expensive if not carried out continuously. It requires a large expenditure of fuel to get up the necessary heat in the furnace, and if there is only one body to incinerate a great part of the heat is wasted. It has, therefore, been decided in Manchester to construct a furnace in which, in the first instance, a gas of imperfect combustion is produced, as in a Siemens producer, and the products allowed to approach near to the body to be cremated, where they come into contact with a certain quantity of heated air, and by

¹ Disposal of the Dead—Health Lectures No. 5.—Series II, 1887-8. Manchester: John Heywood.

the chemical action of the latter are completely burned with an intense heat, to which the body is directly exposed. By this operation a more economical and rapid incineration is effected.

The fuel is introduced through hoppers into a gas-producer (Figure 5) where it is burned with a limited supply of air. The products pass to the front of the furnace into a gas-chamber (Figures 6 and 11) in which they rise and are deflected right and left by the fire-clay ash-collecting tray (Figure 4) at the same time meeting the hot air, as above described. The intensely hot gases thus created rise through the perforated top tray upon which the coffin is deposited (Figures 4 and 6). The air, to effect partial combustion of the fuel, passes through the gas-producer (Figure 5). The air necessary to complete the burning of the gases is admitted through two side flues (Figure 9) and is heated on its way before meeting the deflecting tray of the "producer" gas, in conduits situated between the gas-chamber and the down-take flues (Figure 4).

The products of combustion emitted from the body along with the hot gases will be drawn down the flues (Figure 4) and away to the chimney (Figure 6). In the lower part of the latter, however, there is arranged a coke fire, the object of which is to complete the burning of any smoke or organic vapor that may not have been thoroughly consumed in the process. It is anticipated that with this arrangement there will be no visible emanations from the top of the chimney.

When a cremation is to take place the cortège will enter the chapel, and the coffin will be deposited on the ornamental table or catafalque in front of the furnace, where it may be surrounded by the usual floral decorations. This table is partly covered by an ante-chamber which is provided with a door. Into this the coffin is partly introduced when being deposited, the door *a* of the ante-chamber having previously been opened. Here the service usually read at the grave side may be gone through; at its conclusion the man stationed out of sight at the gearing below will silently cause the coffin to move forward; as soon as it has entirely passed the doors of the ante-chamber the latter closes and the door of the furnace proper opens to admit the coffin. The furnace door is immediately closed after the coffin has entered. All these movements are executed from below and without being visible to those attending the ceremony.

Mechanical means are provided for pushing the ashes from the outside into the urn, which is placed on the outside and below the chamber of combustion.

It will be observed that the arrangements are such as to insure that at no time will the interior of the heated chamber or any flame be visible to those attending the ceremony.

The numerous advocates of cremation will be pleased to learn what ample and carefully-designed provision is being made in Manchester for the carrying out of this method of burial. The arrangements would have been even more complete had the shares in the company been taken up more readily. At present the money in hand is sufficient to justify the directors of the company in commencing building, and it is anticipated that the zeal of the sanitarians will come to their aid when the present funds are exhausted. There are immense numbers of people who are convinced that cremation is scientifically the correct method of disposing of the dead, but who are prejudiced against undergoing the process themselves. It would be inconsistent in them to join the Cremation Society, since they fully intend, when the event can be no longer delayed, to be buried like their fathers, but it is anticipated that they may be willing to subscribe to enable other persons of less conservative disposition to take measures to prevent the presence of their dead bodies being a source of danger to the living they leave behind them in the world.

There is a great probability of the cremation movement spreading, now that it has been taken up in Lancashire. It is a characteristic of the Manchester man that he can never be content to hold any view in isolation. As soon as he has thoroughly adopted an idea he immediately commences to make proselytes to it; he forms a society, holds annual meetings, gives and collects subscriptions, and throws his whole heart into the propagation of the doctrine he has taken up. If he is a politician he works for his party as if his future depended on it; if he takes an interest in art or music, he neither grudges time nor money in their pursuit and in their popularization; if he adopts total abstinence, he looks forward to a speech from Sir Wilfrid Lawson as if it were the first night of a new play; while if he follows the opposite view his hospitality is embarrassing in its plenitude. We sadly fear that when the new building is complete the members of the Cremation Society will often force upon their friends the consideration of a subject which most people prefer to keep in the background. — *Engineering*.

MODEL OF THE PANTHEON AT ROME PREPARED FOR THE METROPOLITAN MUSEUM OF ART, UNDER THE DIRECTION OF M. CHARLES CHUPIEZ.

WE reproduce from *L'Architecture* the illustrations of the great plaster model visited at the studio of the sculptor-modeller, M. Abel Poulin, by the Congress of the Société Centrale des Architectes Français. This model, which attracted the admiration of all who inspected it, is to form part of the Willard Collection of Architectural Casts, and its existence already gives occasion to French architects to hope that it may not be long before their own

museums may contain similar models. As the model is one-twentieth full-size, half-a-dozen persons can enter it at the same time and examine the details without the sensation of being crowded.

THE NEW VICTORIA COURTS, BIRMINGHAM, ENG. MESSRS. ASTON WEBB AND E. INGRESS BELL, ARCHITECTS.

H. R. H. THE PRINCE OF WALES opened this fine building, Tuesday, July 21. We here give the general view of it from the architects' drawing in the Royal Academy Exhibition, reproduced from the *British Architect*.

The Victoria Courts, as our readers will possibly be aware, have been built by the Corporation of Birmingham in accordance with an undertaking to provide assize-courts when an assize was granted to Birmingham. The building was at first intended to contain the assize-courts only, but the scheme grew and it was decided to give up the present police-courts in Moor Street, and house them also in the new building. From the commencement, Sir Thomas Martineau, a leading solicitor in Birmingham, actively interested himself in the scheme, with the result that a site in Corporation Street was granted by the Council, and with the assistance of Mr. Alfred Waterhouse, R. A., plans were obtained in competition, and those submitted by Messrs. Aston Webb and E. Ingress Bell were finally accepted. The foundation stone was laid with due ceremony by her Majesty the Queen, in her Jubilee year, viz., March, 1887, and the building has been in progress ever since. It has cost about £160,000, the site being given by the Corporation.

It comprises two large assize-courts (civil and criminal), each 40' by 56', with reading-room for the Bar, robing-room, consultation-room and all conveniences, retiring-rooms for the judges and jury, solicitors, and witnesses' rooms. Also a third court, two police-courts (each 40' by 30'), and a coroner's-court (30' by 24') with the necessary retiring-rooms. A great feature in the building, both externally and internally, is the great hall, from which four of the courts open direct, and is a very fine apartment, 80' by 40' and 75' in height. In addition, there is a handsome room for the magistrates, a grand-jury room on the first floor, and the necessary offices, also a refreshment block with the kitchens over. In the basement, extensive accommodation is provided for the reception and housing of the prisoners in separate cells.

The façade of the building in Corporation Street, 180' in length shown in the view, is very richly treated in a free Renaissance, and is constructed entirely of red terra-cotta. The sculpture in the central gable bears the Royal Arms, and in the flanking gables, emblematic figures by Mr. Aumonier, representing the arts and crafts in the trades of Birmingham. The richest portion is the central entrance porch, adorned by a statue of Her Majesty in the gable, by Mr. Harry Bates, and four spandrel figures representing the attributes of Justice, designed by Mr. Walter Crane and executed by Mr. Frith. Below the Queen is a group of St. George and the Dragon. The whole building is crowned by a figure of Justice, by Mr. Frith, who also designed and executed the charming little figures on the summits of the turrets. Red terra-cotta was selected as being the best material for withstanding the atmosphere of Birmingham.

Internally the Great Hall, the Court walls above the panelling, and the corridors, are faced with buff terra-cotta by Messrs. Gibbs & Canning, of Tamworth, and the fittings and wall-linings throughout are of oak. The whole of the architectural modelling was admirably carried out by Mr. Aumonier from the architects' designs. The windows of the Great Hall are filled with painted glass, as a Jubilee Memorial of the City of Birmingham, and were designed by Mr. H. Walter Lonsdale, the glazing being executed by Messrs. Winfield. The large window in the east end of the hall contains figures of Hutton, Wm. de Birmingham, Shakespeare, Edward VI, Watt, S. Johnson, Boulton, David Cox, Priestley, Baskerville, Leuch, Dr. Ash, Mrs. Ryland, Josiah Mason, and William Murdoch, all of whom hailed from Birmingham. The west window has figures representing Birmingham industries: stamper, armourer, goldsmith, brass-founder, screw-maker, pen-maker, ironworker, electroplater, iron-founder, glass-cutter, glass-blower, gunmaker, wire-drawer, watch-maker, and medallist. In the north window are figures of Hope and Confidence, and below these the Royal Arms and City Arms, with figures of Past and Future. In the upper parts of other windows are figures of Labor, Health, Recreation, Theory, Technical Education, Practice, Justice, Law, Mercy, Love, Education, and Discipline; and in the lights below these: "The Queen Opening Aston Hall and Park, June 4, 1858," "The Prince Consort Laying the First Stone of the Midland Institute, November 22, 1855," "The Queen Laying the Foundation Stone of the Victoria Courts, March 23, 1887," and "The Queen Inspecting School Children in Small Heath Park, March 23, 1887."

In the boiler-room are fixed the two 50 horse-power Galloway boilers, the pumps, return-water apparatus, and hot-water service heater; in the engine-room are placed the two air-compressing engines with the air cylinder, compressed-air circuits and indicator; and in the distributing chamber the whole of the apparatus of the building is controlled, the heating circuits being divided into seventeen distinct sections. In this chamber are also fixed the pneumatic thermometers, by means of which the engineer in charge can ascertain, at any given moment, the exact temperature of any of the

courts. The boilers and compressors are in duplicate, and the system for warming the building is that of low-pressure steam, the water of condensation being returned to the boilers by an automatic trap. To each court two distinct steam circuits, with regulating valves attached, are taken from the distributing-chamber. One of the circuits is for heating the courts by direct radiation, the several steam radiators being evenly distributed, whilst the second circuit is for warming the ventilation air admitted into the courts from the spacious chambers under the same, which are placed in direct communication with the open air. The object of this double-heating arrangement is to insure that the warming of the courts shall in no way interfere with the warming of the air for ventilation, as by this means and by no other can they be maintained at the requisite degree of heat, and so counteract the varying external temperature of our climate. In order to provide for the circulation of air through the courts from the chambers, exit openings are made in the ceilings, which are in communication with up-cast shafts, every court having its distinct arrangements. In each of these shafts compressed-air nozzles are fixed, six for the civil and six for the criminal courts, four each for the police-courts and two for the coroner's-court, all of which are under the immediate control of the engineer in the engine-room. The air-pressure in these nozzles is from 3 to 4 pounds on the square inch, and when in full operation a velocity from 10 to 12 feet per second is easily maintained in the up-cast shafts. This ensures an extraction per hour from each of the courts of an amount of air equal to five times their cubic capacity. In order to give an idea of the extent of the works above described, it may be mentioned that the direct-heating surface fixed throughout the building is equal to 5,000 square feet, and the indirect heating in the chambers under the courts is equal to 2,800 square feet. The area of the supply and return mains may be estimated at 8,000 square feet, and it is calculated that when the whole of this apparatus is at work, including the supply of steam required by the air-compressing engines, it will necessitate the evaporation of 3,360 pounds of water per hour. For the supply of fresh air to each of the large courts, inlet shafts are provided having an area of 26 square feet, and for each of the police-courts an area of 15 square feet. To all of these inlets water sprays are fixed, in order that the air, during the summer months, may be thoroughly washed before its introduction to the courts.

The building is lighted throughout by electricity supplied from the mains of the Birmingham Electric Supply Company. There are about seven hundred lamps within the whole building, most of them being of 16 candle-power, and a few of 8 candle-power. The clock in the central gable is constructed to show the time on two dials, one inside and one outside the building: it will not strike, or chime. Happily, throughout the whole of the four years, there has been no fatal accident to any of the men engaged thereon.

MONUMENT TO THE LATE LORD FRAZER, EDINBURGH, SCOTLAND.
MR. R. S. LORIMER, ARCHITECT.

THE GRAND PRIX DIPLOMA: PARIS EXHIBITION, 1889. M. P. V.
GALLAND.

RESIDENCE AT BECCLES, ENG. MR. ARTHUR PELLIS, F. S. I.,
ARCHITECT.

This house was recently erected upon the Grange estate, and contains three reception-rooms, eight bedrooms, dressing-room and bathroom. The brickwork is of red bricks laid in blue mortar, the roofs being covered with Broseley tiles.

ST. THOMAS'S CHURCH, TELFORD PARK, STREATHAM, ENG. MR.
SPENCER W. GRANT AND MR. SYDNEY R. J. SMITH, ARCHITECTS.

This church is proposed to be erected in Telford Park, for Archdeacon Gibbs, and some time ago a limited number of architects were invited to submit designs; but at present a commencement has not been made, as the committee do not feel justified in making a start with the funds they have in hand. The church will consist of nave, transepts, aisles, chancel and baptistery and two vestries, and will be built externally of red brick and Bath stone, while the interior will consist of yellow malm bricks for facing, with Bath stone dressings and red Mansfield stone columns. Accommodation will be provided for 800 worshippers, the estimated cost without tower being 6,650*l*.

RESIDENCE, WAKE GREEN ROAD, MOSELEY, BIRMINGHAM, ENG.
MESSRS. ESSEX & NICOL, BIRMINGHAM, ARCHITECTS.

This residence was recently erected for Mr. W. Percy Harrison. The elevations are executed with red bricks and stone dressings, Bracknell rubber bricks being employed for the carved portions. The roofs are covered with brindled tiles.

THE COUNCIL HOUSE, SHEFFIELD, ENG. MR. E. W. MOUNTFORD,
ARCHITECT.

This illustration, copied from the *Builder*, shows the building as it will be actually carried out.

DINING-ROOM IN THE CHATEAU ST. LEGER, ST. GERMAIN-EN-LAYE, FRANCE. M. LEON CARLE, ARCHITECT.

This plate is copied from the *Revue Générale de l'Architecture*.

STANDARDS LOST AND FOUND.

The discovery of the old standard yard and certain other weights and measures supposed to have been lost or destroyed by the fire by which the Houses of Parliament were consumed, in 1834, is of little real interest, seeing that the duplicates escaped that catastrophe. Even the metallic documents which for more than fifty years have laid among other lumber in the Journals Office were long ago replaced by perfect copies. Those which have now come to light are mainly the yard standard, constructed in 1758 from a bar in the possession of the Royal Society, which itself was a copy of a standard preserved in the Tower, and one prepared in 1760 by a committee of the House of Commons. During the fire both were too much injured to be retained, and had not the Speaker been reminded that it is part of his duty to inspect these public instruments once every twenty years, the fact of the bars—for the Troy pound, which is more important, has disappeared—still being in existence might have vanished from memory.

The Warden of the Standards is a functionary of great dignity. He has a little department all to himself, though for practical purposes there is not now much danger of the lieges being cheated out of their due weight and measure. The imperial standard is a bronze bar 38" long and 1" square, on which the defining lines, 36" apart, are cut in gold studs, sunk in holes so that their surface passes through the axis of the bar, which, owing to its thickness, is not liable to be vitiated by flexure. When in use this bar rests on a lever frame, by which it is supported at eight points, 4.78" apart, on rollers, which divide the pressure exactly equally, though, as the late warden pointed out in a treatise devoted to the subject, for less refined purposes measuring bars should be supported on two points, 21 per cent of the whole length from the ends.

By this means the strains in the curves are equalized and a minimum of distortion secured. The yard described is the one used in the Standards Office. In case of injury or loss, four copies of it, identical within one-sixth of a degree of temperature, are deposited in other places (the House of Commons being one) where the specimen is walled up. In like manner, four copies of the standard pound have been prepared in platinum, and placed in the same spots as the standard yards. There are also for public use a series of "end-standards" exposed on the outer wall of Greenwich Observatory, and, though the thousands who pass them every day are not aware of the fact, the granite steps along the back of Trafalgar Square have been utilized for marking a length of 100', and another of 66'—that is, a chain—on brass plates let into them. What is more, the minute error of these measures by varying temperature has been so accurately determined that, according to Mr. Flinders-Petrie, the total length of the chain is never more than .019", or of the hundred feet more than .01 from the truth.

At Greenwich, also, there is a public balance, by which the nicety of weights can be determined, though delicate weighings for scientific purposes are usually performed at the Standards Office, in a vacuum case with glass sides. Measurements, to be considered "scientifically accurate, must be not more than .0005" in error in the yard, while more than .0025 grains in the pound or .001 grain in the ounce, or one grain in the gallon, or four grains in the cubic foot, would condemn any calculation into which weights or measures entered. For commercial purposes a greater latitude is permitted, a limit of 1 in 20,000 being suggested by the commission of 1851. Happily, when ordinary folks buy an ounce of tobacco over the counter, or are measured off a yard of ribbon, they do not expect anything like this minuteness.

Nor would the copies of the "standards" in use always meet the requirements of their prototypes in Old Palace Yard. But when great geodetical operations are undertaken, an inch more or less becomes a serious matter. Thus, in measuring a base-line of 8.912', for the purposes of the Indian Trigonometrical Survey, four repetitions of the test did not detect more than a difference of .0045 portion of a foot over the length calculated. Again, the 2,483.5381 metres base-line measured in the province of Barcelona was found on the second trial to have a length of 2,483.5383 metres. This difference may, of course, be explained on the ground of changes of temperature affecting both the instruments and the earth, not to mention the personal factor, which more or less modifies every operation. Of late it has been found that the latitude of several public observatories has in the course of years undergone minute variations which are attributed to the actual shrinkage in the crust of the earth. These infinitesimal differences do not, however, affect the every-day work of life. Yet in every European country equal care is taken to prevent any growth of error in the public weights and measures. In France, for instance, the standard kilogram is a cylinder of platinum of equal diameter and height, while the metre preserved in the Metric Bureau at Paris is of platino-iridium, constructed with the anxious care which so important an international record demands.—*London Standard*.



[The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.]

THE FORMULAS FOR DEFLECTION OF BEAMS.

DENVER, COL., August 20, 1891.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—I have just read the communication in the *American Architect* of August 15, relating to the formulas for the deflection of beams, and your reply. Your answer was very well put, for the strength of beams, but I think your correspondent referred to the tables on stiffness of beams, in which the Modulus of Rupture does not enter, but the Modulus of Elasticity, and in this case the factor-of-safety is the limit of deflection allowed, which in my tables is 1-30 of an inch per foot of span. I think the constants for deflection employed by me are absolutely safe and about the average given by different tests. It has been found that the Modulus of Elasticity does not differ greatly with the size of the timber.

In regard to the Modulus of Rupture, I have decided to change the values in the next edition of my book to agree with the average results obtained by Professor Lanza from his experiments, in order to conform more closely with other tables. But with these constants I think a factor-of-safety of 3 is ample in any ordinary building construction, even when the loads are figured about what may actually be applied. As you stated in your reply, it has been the custom to figure the superimposed loads on floors from two to four times what it is ever likely to be, which of course increases the factor-of-safety proportionally, and in that case the constants for strength of timbers given in the present edition of my hand-book are abundantly safe.

Yours very truly, F. E. KIDDER.

THE TEMPLE OF BAAL.

TORONTO, CAN., August 17, 1891.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—To prevent a misunderstanding I wish to call your attention to the illustration of the "Ground Plan of the Temple of Baal," as it appears in the article on "Ancient Architecture for Students," in Saturday's issue of the *American Architect*.

The plan there given is not that of the temple at Babylon, which was a square; it is the plan of the temple at Carthage, a description of which will appear in the chapter on that place.

Yours truly, R. W. GAMBIER-BOUSFIELD.

THE CALVERT MONUMENT AT ST. MARY'S, MD.

BALTIMORE, MD., August 24, 1891.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—On looking at the current number of the *American Architect* this morning, I was pained to see that your correspondent from this city had seen fit to go out of his way to make a statement gratuitously insulting or wounding to the feelings of the Catholic portion of your subscribers and readers.

I presume summer vacations prevented due editing of the matter, for I am sure you will agree with me that your paper should be kept strictly non-sectarian and purely confined to the reason of its existence; and there was not the smallest excuse for this correspondent to make a partisan statement, which has since been exactly contradicted in the public press in proofs, which, though they may not have satisfied your correspondent—if he saw them—were at least quite convincing to many others.

I would cite these answers to you, but it would be a continuation of the error your correspondent already commenced by devoting a portion of your columns—intended for professional subjects—to a religious controversy.

(I can, however, give the information to any who seek it.)

In making a statement such as your correspondent has done—reflecting on the followers of any particular creed, I believe, indeed, that the attacked have the right to insist upon presenting the argument from their side. This would show the egregious error of making such a statement in such a paper as yours.

I will not take up any more of your space, for I ask the favor of the publication of this mild protest in your next, but will subscribe myself.

Yours obediently, "CALVERT."

[We regret that we cannot feel that the paragraph relating to the Calvert monument stood in any need of editing, nor can we agree that the columns of this journal shall be devoted absolutely to the statement and discussion of purely professional facts—they would offer but dreary reading the greater part of the time. "Calvert" may rest assured that it was neither our nor our correspondent's intention to flout members of the Catholic persuasion; and to tell the truth the above disclaimer is so vaguely put that we do not know where the error of statement which "has since been exactly contradicted" lies: whether no Calvert memorial was erected; whether the Catholic Church has never boasted of its religious toleration in early times; whether Lord Baltimore was not trained a Church of England man, or did not return to his early belief before he died, or finally whether the Protest-

ants were not obliged to borrow artillery to protect themselves from oppression by the dominant sect. A categorical denial or a refutation of any of these statements supported by adequate proof would be held by us—notwithstanding "Calvert's" opinion to the contrary—matter entirely pertinent to our column. Our correspondent, in stating his facts, did not in the slightest degree enter on the domain of "religious controversy," nor has he departed from the simple rôle of the narrating historian. If the statements are historically incorrect they can be historically corrected.—EDS. AMERICAN ARCHITECT.]

BOOKS ON BRIDGE BUILDING.

SAYVILLE, LONG ISLAND, August 12, 1891.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—Will you kindly give me a list of the best works on "Bridge Building," in your answers to queries?

Yours truly, I. H. GREEN.

[WITHOUT professing to have an expert knowledge of bridge building, we can say that the reputations of their several authors should recommend the following works: De Volson Wood's "Treatise on the Theory of the Construction of Bridges and Roofs"; C. E. Greene's "Bridge Trusses"; Mausfield Merriman's "Text-book on Roofs and Bridges." These and other books bearing on the same subject are published by J. Wiley & Sons, New York, N. Y.—EDS. AMERICAN ARCHITECT.]

MISUSE OF THE WORD ETCHING.

MILWAUKEE, WIS., August 12, 1891.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—A difference of opinion has sprung up in regard to the following expression used by a committee of the American Institute of Architects in a competition programme. It reads as follows: "All drawings shall be made in black lines, no shading being allowed, except line etching on the perspective." Now is the expression "line etching" correct, if used on a pen drawing? A pen drawing is no etching. Should it mean line shading, as used in nearly all perspectives in the *American Architect*?

I would be greatly obliged to you, if you would give me a correct explanation of this term, and refer also, to some perspectives or drawings in the *American Architect*, which will show this manner of rendering drawings. I have all numbers since 1882 of your paper.

An early answer will greatly oblige,

Yours truly, C. H. RAU, Architect.

[THE language used is inexcusable and can have no certain interpretation. It would be our opinion that, under a condition so expressed, a competitor would be entitled to submit a perspective drawing carried to the utmost extreme of elaborate rendering with pen and ink, provided that neither color nor brushwork were used, and yet we seriously doubt whether this particular committee would accept such a drawing. The application of the word "etching" to a pen drawing is absolutely, unqualifiedly and always wrong. The use of the word in connection with pen-drawing is a Westernism.—EDS. AMERICAN ARCHITECT.]



HINDU ARCHITECTURE.—Hindu architecture, strictly so called, first makes its appearance about the fifth century A. D., at the time when Buddhism had begun to decline and Brahmanism was beginning to take its place. The original purity of the Buddhist architecture was beginning to be lost about this time by the absence of the many higher aesthetic qualities, though very considerable vigor is evinced by these works, and a rich effect is produced by the elaborate and profuse ornamentation. The earliest types of Hindu temples are to be met with in Orissa, the most celebrated of which is the great temple of Bhuvaneswara, which is supposed to have been built in the seventh century, A. D. Of the elaborate carving and splendid sculpture work of these earlier temples, Dr. Fergusson speaks very highly.

"Most people would be of the opinion that a building four times as large would produce a greater and more imposing effect; but this is not the way a Hindu ever looked at the matter. Infinite labor bestowed on every detail was the mode in which he thought he could render his temple most worthy of the Deity, and, whether he was right or wrong, the effect of the whole is certainly marvellously beautiful. The sculpture is of a very high order."

Next there are some excellent specimens of architecture to be met with in Bundelcund, Rajputana, the Maratha country, and Southern India. Temple building in the south did not commence till very late, at a time when the north was under Mohammedan rule. The earliest temple—that of Tanjore—was built so late as the fourteenth century. Nevertheless, during these five centuries numerous structures, bewildering in their richness, grandeur and beauty, have sprung up. Among these may be mentioned the elegant and graceful pagoda of Tanjore; the ancient and venerated temple of Chidamburam, with its gopuras, or gateways; the elegant temple of Parvati, and the magnificent hall of 1,000 columns; the magnificent temple of Sierangam, with its fifteen elaborately carved and ornamented gateways; the great temple of Madura, with its nine gopuras and elaborately-sculptured hall of 1,000 columns; the celebrated shrine of Rameswaram, with its four great (though unfinished, except one) gopuras, the glory of which consists in its corridors, which extend to a total length of 4,000 feet, and the great temple of Conjeeveram, with its large gopuras, a hall of 1,000 columns, some fine mantapas, and large tanks. Speaking of the corridors of the Rameswaram temple, Dr. Fergusson says:

"No engraving can convey the impression produced by such a display of labor when extended to an uninterrupted length of 700 feet. None of our cathedrals are more than 500 feet, and even the nave of St. Peter's is only 600 feet from the door to the apse. Here the side corridors are 700 feet long, and open into transverse galleries as rich in detail as themselves. These, with the varied devices and mode of lighting, produce an effect that is not equaled certainly anywhere in India. Here we have corridors extending 4,000 feet, carved on both sides, and in the hardest granite. It is the immensity of the labor here displayed that impresses us, much more than its quality, and that, combined with a certain picturesqueness and mystery, produces an effect which is not surpassed by any other temple in India, and by very few elsewhere."—*The Nineteenth Century*.

PHILADELPHIA'S NEW CLOCK-TOWER.—The clock-tower to surmount the new Public Building in Philadelphia is standing complete in the yards of the Tacoma Iron Company. This clock-tower, which is entirely of metal, rests on the marble-work of the tower which rises to a height of 337 feet 4 1/2 inches from the ground. Set in the stone base are eight composite columns rising vertically to a height of 67 feet 8 inches above the marble work, and above that converging towards the centre to receive and support the cast-iron base-plate of the figure of William Penn, at a height of 173 feet 3 inches above the marble-work base. The whole of the outside shell, to a height of 67 feet 8 inches above the marble-work, is of cast-iron sectional plates of an average of one inch in thickness. Not to be included in this are the four figures, the four eagles and the clock-face. These, together with the whole of the external covering of the dome, from the level of 67 feet 8 inches above the marble-work, upwards and including the central figure of William Penn on the apex, which rises to the additional height of 36 feet 8 inches, are to be made of aluminum bronze. All portions with large plain surfaces are made of sheet metal not less than one-eighth of an inch in thickness. The face of the clock is to be 23 feet in diameter and its altitude from the ground 250 feet. The clock will be wound by a steam engine. The bell is to weigh between 20,000 and 25,000 pounds, and will be second in weight to the great Montreal Cathedral bell, which weighs 28,000 pounds, and it is expected that its peal will be heard even in the most distant part of the city. Chimes similar to those of the Westminster clock will be used, ringing at the quarter, half, three-quarters, and hour. To distinguish the time at night, the dial will be illuminated by electricity, so that the position of the hands can be seen from any point of the city. The minute hand is to be 12 feet and the hour hand 9 feet in length, while the Roman figures on the dial will measure 2 feet 8 inches in length.—*Jewellers' Circular*.

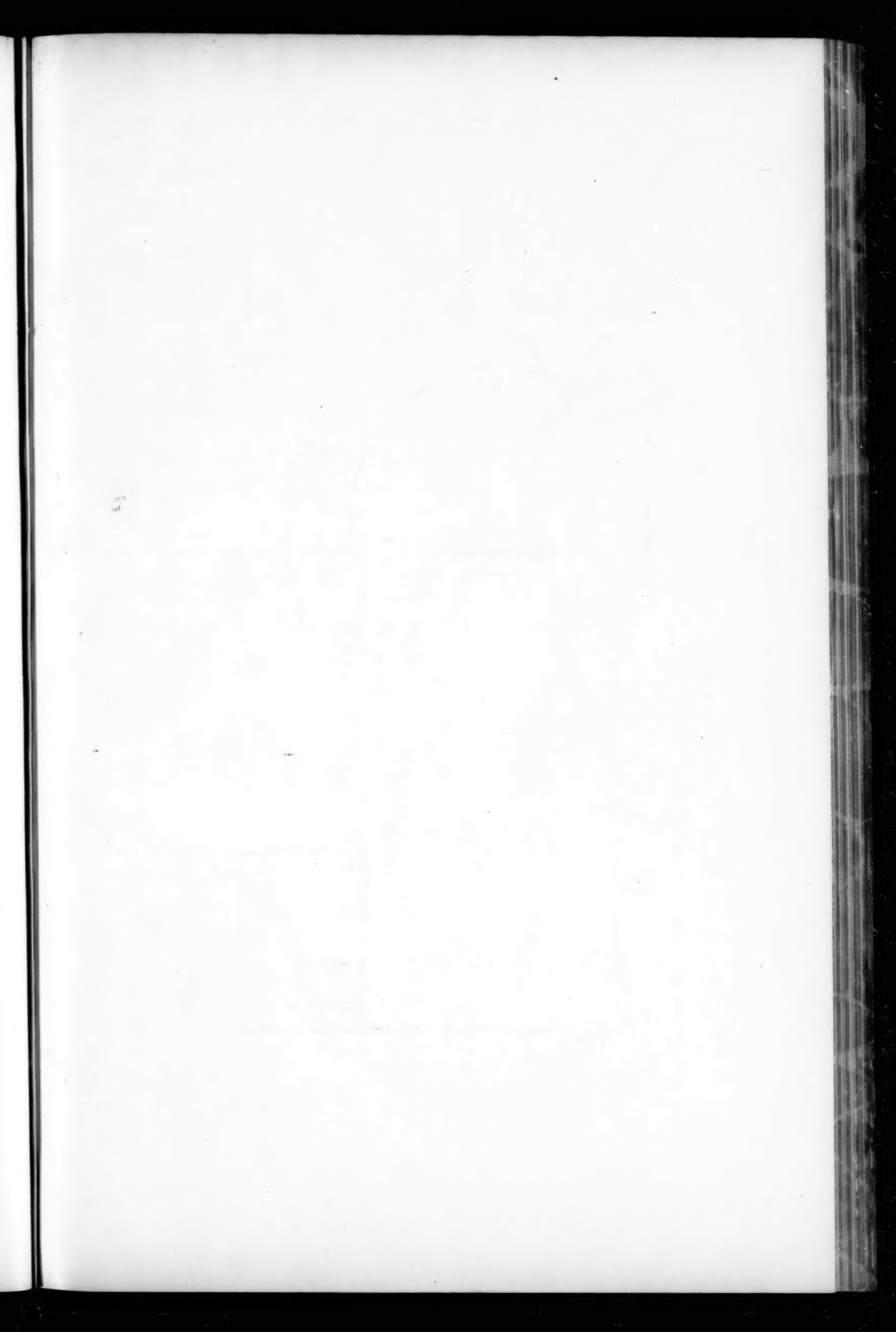
WATER-PIPES OF ALDER.—Formerly the large alder was much esteemed for such parts of works as lie continually under water, where it sometimes became as hard as stone, but if suffered to lie exposed to the weather, and at other times under the ground in watery places, it decayed in a short time. Vitruvius informs us that the morasses about Ravenna, in Italy, were piled with alder timber, in order to build upon, for which use he highly commends it. The Rialto, at Venice, is said to have been built upon piles of this wood. Trunks of trees or poles of alder were at one time much used in England for water-pipes for the conveyance of water through bogs and dams, and also for water-pipes for conveying water to supply houses from any spring. Large poles of trees of this wood were also used for ground-cuts. The poles were about 8 or 10 inches in diameter, and the cavity in them about 4 or 4 1/2 inches. But for water-pipes, poles above 4 or 5 inches diameter were sufficient, with the cavity about 1 1/4 inches or 1 1/2 inches. The method of boring alder-pipes was as follows: The poles being laid on tressels of a proper height to rest the auger upon while boring, the men set up a lathe to turn the least end of the poles to fit them to the cavities of the great end of the others. The lathe being set up and the poles cut to the lengths they would conveniently hold, 8, 10 or 12 feet, they turned the small ends of the poles (about 5 or 6 inches in length) to the size they intended to bore the larger ends (about the same depths, viz. 5 or 6 inches). It was generally intended to make a joint to shut each pair of poles together; the concave part being the female part, and the other part the male of the joint. In turning of the male part they turned a channel in it, or a small groove at a certain distance from the end; and in the female part they bored a small hole to fit over this channel. This being done, they bored the holes through, and, to prevent them from boring out at the sides, they stuck great nails at each end, to be a guide to them in boring straight through, though they usually bored them at both ends, by which means, if a pole were crooked one way they could bore it through and not spoil it. The holes being bored, they formed them into pipes in the ground, for which purpose they dug a trench, and prepared it with clay to ram in the concave part, which was first bound with an iron ring round it to prevent it splitting. Afterwards they drove in the convex part till the groove in it was just under the hole, and poured melted pitch, hot, into the hole in the female part. By this means the junctures were rendered very compact and close, and they proceeded until they laid all their poles or pipes in their order.—*The Architect*.

ASPHALTUM FOR BUILDING.—Mr. W. C. Ambrose, M. Am. Soc. C. E., recently read a paper upon this subject before the American Society of Civil Engineers. The lecturer stated that the Ventura Division of the Southern Pacific Railroad was built for several miles along the bluffs facing the Pacific Ocean. The material of these bluffs is sand and gravel between strata of soft rock, soluble in water; and though the violence of the waves is moderated by a group of islands about 22 miles off shore, at high water of spring tides with south-west gales they wash away the bank very rapidly, and protection for the road in some places was soon found necessary. The sea-shore at the foot of these bluffs is generally covered two or three feet deep with boulders and sand over the hard bed-rock—hence, the use of piling

was impracticable. The rise and fall of tides, which would interfere very much with the work of building a concrete wall, as well as the high cost of labor, would make such a wall very expensive, so it was decided to try the use of asphaltum for a mortar to hold the boulders together, as a wall made of boulders alone had been easily knocked down by the waves. At various points near this part of the road there are beds of material known as bituminous rock, and asphaltum. The first contains fixed bitumen, 24.4 per cent, and ash 75.6 per cent; the ash, consisting of silica, 46.8 per cent, carbonate of lime, 9.1 per cent, oxides of iron and alumina, 15.9 per cent., and other ingredients, 3.8 per cent. This material is much used in California in making pavements, and in coating piles to resist the teredo, which it does effectually. In order to liquefy it when heated, coal tar or crude oil must be added. About 200 feet of wall was built with this material, and it has stood perfectly for the last three years, and prevented any washing away of the bank. After building this section of wall, the other material, known as asphaltum, was tried because it was cheaper. It liquefies without the addition of any flux, and when cooled is not quite so hard but more elastic, and on the whole as good a cement as the other. It is often used for lining cisterns, and was used for 800 feet of this wall. The wall was made 6 feet wide at the bottom (where it was in contact with the bed-rock), 2 feet wide on top, and 9 feet high, the landward side, which was built close up against the cliff, being vertical. To economize asphaltum, only one-half the wall, viz.: two feet backward from the seaward face, was cemented. The cost was \$3.75, or 15s. 7 1/4d., per cubic yard, which included everything except the old ties for fuel, and rail-transportation 28 miles for the asphaltum. In building this wall a layer of stones was placed, and the melted asphaltum poured over it so as thoroughly to fill all interstices and run down to adhere to the next layer of asphaltum. In warm weather the asphaltum becomes quite soft, but not liquid, and in this condition has little tensile strength, but the first spray from the waves hardens it just when necessary. The only part of the wall which failed was a short section where, to improve the alignment, it was built a little outside the base of the bank, the space between being filled with sand. During a heavy storm, waves dashed over the top of the wall and saturated the sand, and the resulting increase in thrust from behind, pushed the wall over. This, of course, could have been avoided by making the wall so high that spray could not fly over it, or by increasing the width of the base to resist pressure from the land side.—*Specialities*.

DISCOVERIES OUTSIDE THE WALLS OF ROME.—The works in progress outside the tract of the city walls between Porta Salaria and Porta Pinciana continually bring to light some interesting object which recalls attention to the study of ancient Rome. Quite recently a fine half-sized statue of Hygieia (unfortunately headless) was disinterred. Her drapery leaves bare the right shoulder and arm, around which twines the mystic serpent, likewise decapitated. This statue is of Carrara marble, and of moderately good sculpture. Near the same place has also been discovered a large sarcophagus in excellent preservation, still containing the bones of a husband and wife mixed with the earth, which, through the absence of a cover, has filled up the interior. The principal front of this sarcophagus is adorned with the central circular shield, upon which are merely blocked out the heads of the married pair which were destined to have been finished into portraits at the time of death. But the symbolic and decorative portions of the front are carefully chiseled. Under the shield is a pastoral scene. One shepherd is sitting upon a basket, which he has turned upside down, and is milking two goats, while a second stands before him playing the bagpipes. At the right corner of the sarcophagus is a bearded man, with long hair, of the Greek type; to the left is a female draped figure, also Greek, in the act of holding up her mantle with her right hand. This sarcophagus is of Pentelic marble and probably was sculptured in Greece during the third century of our era. At that period it was the custom in Rome to import from Greece these marble sepulchres ready sculptured, all but the shield intended for the individual portraits, and they were publicly sold by the undertakers of the day—a custom indeed still practised in Rome, where shops containing funeral monuments to order are still to be seen, as in the streets near the Forum. In the same zone, four meters under ground, a very beautiful ancient Roman poniard was also found. The handle is of massive bronze of octangular form, ending in a boar's head finely fused and chiseled in high relief. The blade is two-edged, twenty-four centimetres long and four-and-a-half broad. It is assigned to the age of the Antonines, and Signor Castellani, an eminent archaeologist, considers it must have been an arm used in the chase, for boar hunting probably.—*Galignani Messenger*.

A VIENNA AQUEDUCT.—The high-service brick supply-aqueduct of Vienna, which is nearly 55 miles long, and is carried in many places by series of stone or brick arches, gave considerable trouble formerly by becoming "wet" on the soffit of the arches and sides of the walls. On carefully investigating the matter it was found that the difference in temperature between the inside and the outside of the aqueduct caused extremely small cracks to occur in the Portland cement lining, through which the water slowly escaped. For some years it was customary to replace the worst portions of the lining every fall, the local conditions preventing any extensive repairs taking place simultaneously. According to the *Wochenschrift des oesterr. Ingenieur-Vereins*, a preparation is now used which can be laid over the cement and is elastic enough to stretch without showing cracks. This preparation was invented by Herr Johann Bosch, who has called it "boschin." Its principal ingredients are said to be asphalt, india rubber and mineral tar, and it costs about two-and-a-half florins per square metre, or about ninety-five cents per square yard. The material has been subjected to very exhaustive tests of its adhesion to cement, its impermeability and harmless character with regard to the water supply, and is reported to have proved satisfactory in every respect.—*Engineering News*.



South Devon Youth Centre

Drawings for a Casino at
Loyola University Chicago
Keymann Design Company
Wheeling, W. Va.

Veranda.

Bar Room

Office

Recreation Room

Kitchen

Dining Room

Dining Room

Veranda

First Floor Plan.

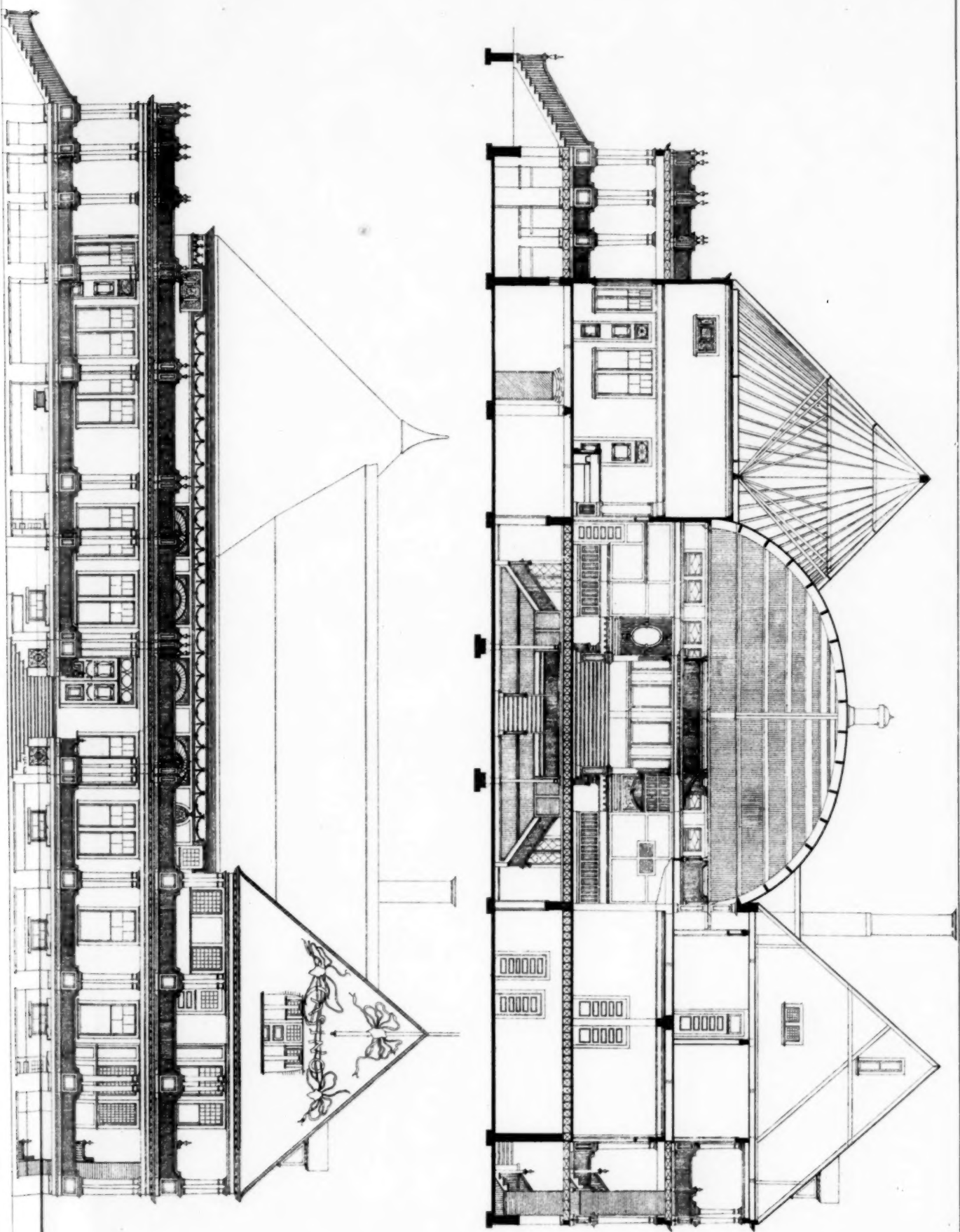
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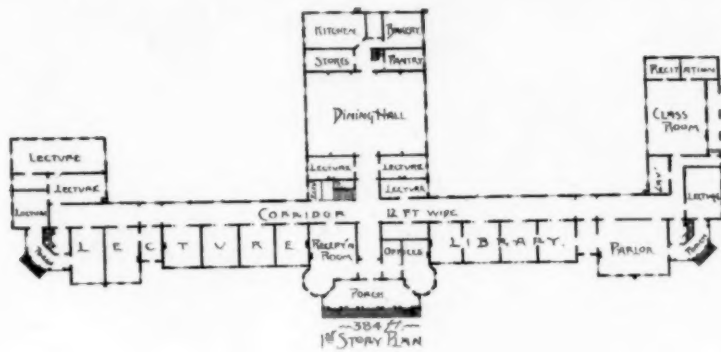
AMERICAN ARCHITECT AND BUILDING NEWS, Nov. 29, 1891.

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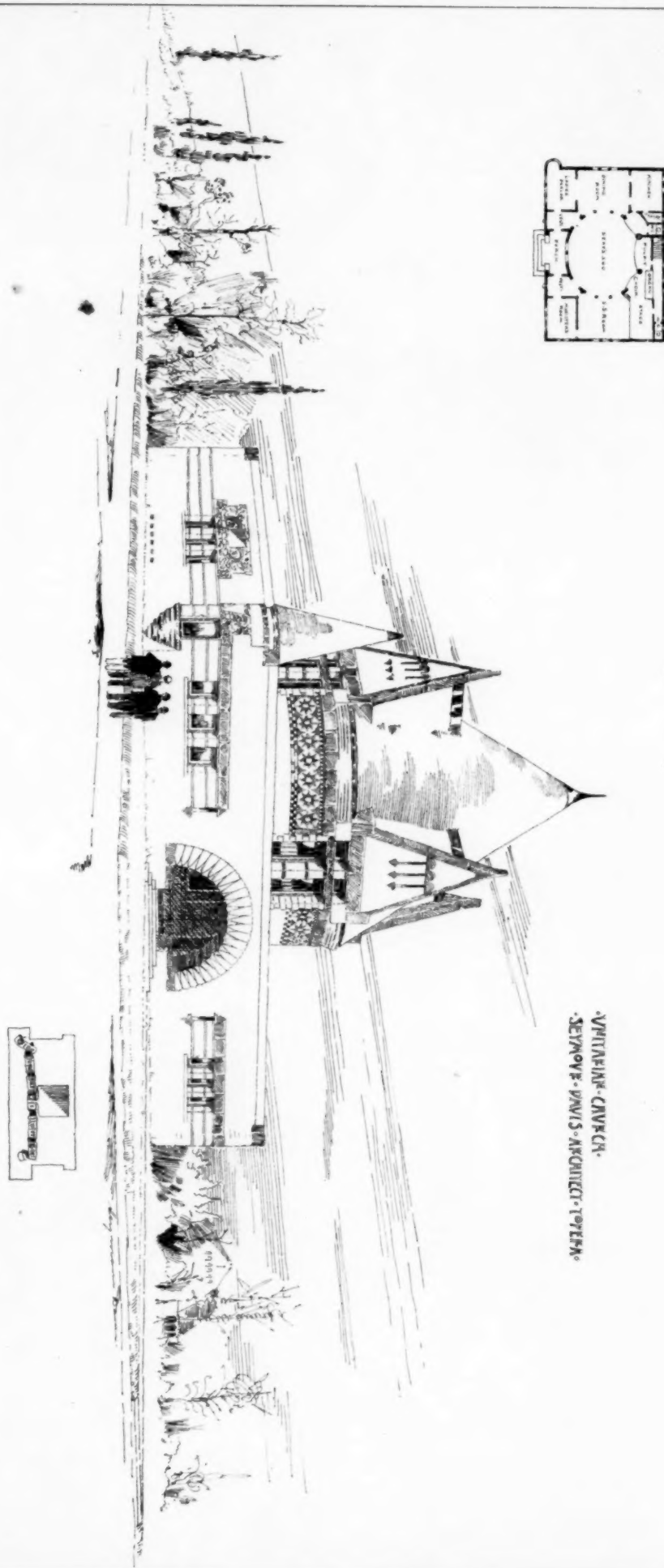


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