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ALTHOUGH newspaper reporters and editors cruelly misuse comparatives and overindulge in superlatives, to the great injury of their readers' sense of proportion, logic, perspective and truth, they can plead in defense that their work has to be done at speed and so they do not really have time to notice that they are practising in public the great American vice of exaggeration. But when a private individual finds himself inclined to thrust his opinion on the public he, for whom the "form" is not waiting, should weigh his words with a leisurely consideration which is denied to the penny-a-liner. It was amiable on the part of a certain sculptor, the other day, irritated because the newspapers were giving more attention to the sensational aspect of the recent tragedy than to the merits of the victim as an artist, to call attention to the "stupendous loss that has befallen the country in the death of Stanford White," but we do not believe he stopped to weigh his words. The loss of a Titan in art might be "stupendous," but we have long had misgivings as to whether, in spite of the Titanic size of our buildings, they were not the work of pygmies rather than Titans, and this in face of the labored efforts of the magazine-writers, who seem determined to sap the native modesty of all those artists, be they painters, sculptors or architects, who have had the fortune to secure the patronage of the wealthy.

WHOSOEVER may undertake to write a proper appreciation of Stanford White's work will do well to begin by placing side by side photographs of the Giralda at Seville and Madison Square Garden tower, the porch of the Church at St. Gilles and that of St. Bartholomew's in New York, the Palazzo del Consiglio at Verona and the *Herald* Building, New York, *et ainsi de suite*. This done, he will probably find it desirable to turn elsewhere in search of results he is willing to cite as evidence of the architect's prowess, upon which to rest his claim to lasting distinction. These evidences may be found in the justness of purpose, the delicacy of proportion, the flow and sweep that mark his monumental work proper, and the same characteristics plus warmth, richness and harmony of color in his interior work. In short, we believe it will be found that his real native ability—and that of a very high order—was rather that of the painter than the architect. For our own part, we shall refrain from using the words "stupendous loss" until some Titan passes, and, so far as these rarities are concerned, we ask that it may be remembered that those who have through the ages been accorded the title of Titan in art did not have at hand a well-plenished cabinet of photographs. There are to be seen on all sides buildings which, if it were the custom of architects to "sign" their buildings, should, to be properly credited, be inscribed as "after So-and-so," but which the uninstructed public believes is of quite modern authorship. We are glad these buildings exist about us; their presence is beneficial; it is right that their graces should have an influence on our American civilization, but it seems rather unfair that the merits of the originators should be so absolutely merged in those of the followers.

A MAN may without blame buy a copyrighted book, tear out the title-page and let it pass nameless to his heirs. He may buy a painting which its author believed not only to be immortalizing but imperishable, may weary of it and throw it into the fire, may paint it out entirely and paint a new picture on that foundation; but he may not merely make alterations or improvements and leave the artist's signature as sponsor for the mutilated work. In a similar way he may deal with sculptures he has bought, for no purchaser guarantees perpetuity to his purchases. If an owner may blamelessly deal in this way with works of art intended to be long-lived, if not immortal, it is not easy for every one to see why the converse act may not be equally allowable, and why an owner may not endow with immortality a work of art that its author intended to be merely ephemeral. At this moment Mr. C. H. Niehaus, sculptor, takes one view, while the Louisiana Purchase Exposition Company takes the other, the matter in dispute being the Exposition Company's right to perpetuate in enduring form—by casting in bronze, that is—the equestrian statue of "St. Louis" which Mr. Niehaus created in "staff," as was befitting a group intended to be short-lived. The sculptor does not object to immortality, but he asserts a right to being immortalized in a proper way, and so claims the privilege of remodeling and improving his group, or at least that he shall be paid for this secondary service which was not part of the original contract between him and the Exposition Company. The case is identical in its ethical aspects with those cases where an architect expects a supplementary commission where duplicating buildings are erected from a single design.

AFTER rather a long period of abstinence, the Government has decided to resume building operations, and the closing days of the late Congress saw the passage of an "omnibus" Public Buildings bill which carried ap-

Entered at the Post-Office at New York as second-class matter.

propriations totaling the fairly respectable sum of twenty-one million dollars. Although not all of the ninety-one items relate to new buildings, there are enough of these to warrant the Supervising Architect in restoring to its normal strength next winter the office working-force which he had to reduce so markedly last year, because there was not work enough on hand. The erection of public buildings and the improvement of rivers and harbors should be amongst the most legitimate operations of a Government, and it is a great misfortune that appropriations for both classes of work have been so mishandled in the past as to link these operations in the public mind with the idea of scandal and corruption.

MORE than other towns, Boston cherishes its landmarks and, no less, the general rights of the publice, even when it costs much money to do so. Warned by the dangers foreshadowed by the lofty Ames Building, it passed a general height-limit law. Warned again by the Westminster Chambers that there were places where even this limit was too liberal, it enacted a necessary amendment to the law, and later, perceiving that even the ninety-foot rule would not safeguard the State-house on Beacon Hill from essential obliteration in the landscape, enacted still another amendment which fixed the height-limit of buildings in the neighborhood of the State-house at seventy feet. Strictly, it is not fair to say that Boston did these things: they were accomplished by independent groups of wise and far-sighted citizens who actually were opposed by the city authorities, opposed because these guardians of the public purse realized that, as these new height-limit laws bore only on certain property-holders, the city would be called on to compensate them in damages. And, sure enough, not only has a heavy indemnity to be paid in the Westminster Chambers case, but owners of land about the State-house are seeking similar relief, but with this difference: they look to the Commonwealth of Massachusetts and not to the City of Boston. The first of these suits has just been settled, the full bench of the Supreme Court having last week handed down a decision that Mrs. L. N. Raymond is entitled to recover $32,500 and interest because of the height-limit restriction placed by the law of 1902 on her land at the corner of Park and Beacon Streets.

IT was inevitable that such a change in management as has taken place at the Metropolitan Museum of Art, and the reconsideration and rearrangement of its treasures that naturally resulted from it, should have given excuse for a very desirable weeding-out of the exhibits, and it is said that a considerable number of articles are to be relegated to the limbo of the unworthy in the storerooms and cellars of the institution. The recent announcement that a considerable number of sculptures are shortly to be removed has caused it to be suggested that a better use could be found for them, and that the schools, the College of the City of New York, or Columbia University might be glad to give house-room to these discarded works of art. The idea, in the form in which it is presented, does not appeal to our sense of fitness, for educational buildings should contain works of art only of real educational value, for they should not be, as museums often permissibly are, considered storehouses of works of art of a certain undetermined value. It is possible that the discarded sculptures might be made of use and service by inducing the architects of the new union railway-stations in this city to provide places for them in their several waiting-rooms, where they would help to lighten the tedium of delayed travelers. What is really needed, however, is a museum which should play to the Metropolitan the part that Bethnal Green plays to the National Gallery. Such a museum, established, say, on Tompkins Square, would be a very useful and welcome addition to the city's educational resources, and if, after it were established, it should be developed on the South Kensington lines, it would remove from the probable programme of the new Metropolitan management a temptation that a good many sensible people would be very sorry to find had been yielded to.

POSSIBLY they may "do things better in France," as the saying has it, but we have certain evidence that they do do things better in England than we do, taking as a gauge of conduct the wonderful discussion in the United States Senate as to what was the proper treatment to accord to architects. Some time ago it was noticed that work did not seem to be proceeding as it should on the great Government building on Great George Street, London, designed by the late J. M. Brydon. Inquiry disclosed the fact that some one in the Government didn't like the design and proposed to improve it by omitting the towers that belonged to it. As Mr. Brydon was dead and could offer no effective remonstrance, the Council of the Royal Institute of British Architects took up the matter and presented an appeal. Early this month a Member, in the House of Commons, asked the First Commissioner of Works what he proposed to do in the premises. Answering his inquisitor, Mr. Harcourt said he had written in reply to the Institute that, though he maintained his own opinion that the proposed very high towers in the Great George Street front were "not architecturally or æsthetically desirable," he was not prepared to pit his artistic opinions against those of the R. I. B. A. Council. He had therefore ordered work to be resumed and the towers completed as designed by Mr. Brydon. Further, he had added, "I shall always value any criticism or assistance that the Institute is good enough to afford me in that part of my duties which is connected with architecture." Fancy Speaker Cannon replying in such good form to mere architects!

THERE is so much of good to be derived from an association of the architects practising in a given neighborhood that the formation of such bodies deserves to be encouraged. But we regret to find it stated that the architects of Columbus, O., are inclined to organize an architectural society for the express purpose of "stopping alleged rate-cutting." It is deplorable, perhaps, that rate-cutting should be practised in that or any neighborhood, but an association expressly founded to cure that evil would seem to fall rather into the class of trade unions than into that where societies of artists are usually to be found.

ARCHITECTURAL FASHIONS[1]—IV.

THE GOTHIC EPISODE UNDER THE MONKS.

WE have seen that both architecture and decoration still show the influence of several fashions which can, without exaggeration, be called old, and it may be of interest now to trace the course of more modern modes.

To the student of architecture the most important movement which has taken place in the art of building is that which spread through Europe in the twelfth, thirteenth and fourteenth centuries, and not only revolutionized the science of construction, but developed a system of ornament utterly unlike anything that had ever been seen before, yet more graceful, exuberant and varied in resource than any other known style. Considering that all other systems of architectural ornamentation have been the slow growth of centuries, and, even then, have almost always been based on some easily recognizable prototype, the rise of the Gothic style, which, starting with the problem of decorating constructions of forms previously unknown, and referring to nature only for inspiration, reached, in about a hundred years, the highest pitch of beauty and magnificence, is the most extraordinary phenomenon in the history of art; but, as the æsthetic development of Gothic architecture cannot be understood without some knowledge of the development of the system of construction to which it was applied, this should be considered first.

The year 1000 was looked forward to with great apprehension throughout Europe, as the appointed date for the end of the world, and for a Last Judgment which the principal personages of that era probably felt themselves indifferently qualified to undergo. Except in Venice, whose inhabitants seem to have been comparatively easy on this score, there was, as the fatal day approached, little building in Europe, those who possessed the resources for such purposes preferring to employ them in penances rather than erecting structures for Beelzebub to occupy. As the millennial year passed without mishap, and the first day of 1001 dawned, there was a revulsion of popular feeling, which the monks, who were the missionaries and teachers of the age, were quick to utilize. From the ferocious barons, most of whom had anticipated with terror the coming of the avenging angel, they extorted an agreement to abstain from murder on one day in each week, in recognition of the Divine clemency toward them; and, this point gained, they followed up their success by energetically enlarging and multiplying their convent churches, so as to bring the Christian teaching to as great a number of people as possible before the receptive mood had passed away.

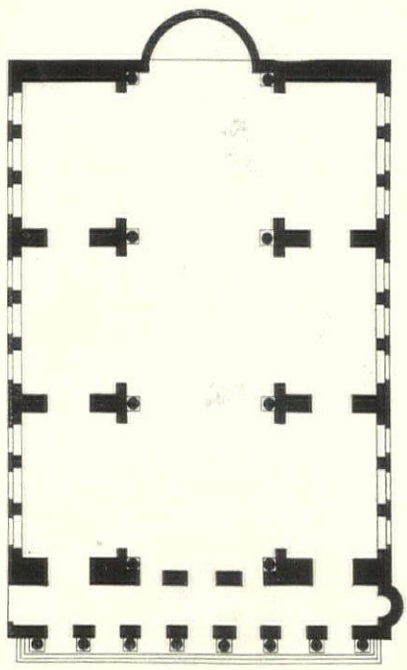


FIG. 20. BASILICA OF CONSTANTINE, ROME.

At that period the monks themselves were the only persons who possessed intelligence enough to plan or build a church, and the priors of the convents, who maintained frequent relations with the chiefs of their order in Italy, and had often been educated in Italian convents, naturally chose for their models the Italian ecclesiastical buildings. Most of the churches in Italy in the eleventh century were of the so-called "basilica" type, consisting of an oblong room, divided by two longitudinal ranges of columns into a middle space, or nave, with a narrower space, or "aisle," on each side. (Fig. 20.) The end of the room opposite the entrance door was formed into a semicircular recess, known as the "apsis," or "tribune," with a small room on each side, serving as a sacristy or store-room. The whole arrangement was very similar to that of the ordinary court-house of the Roman towns, which was also divided into nave and aisles by

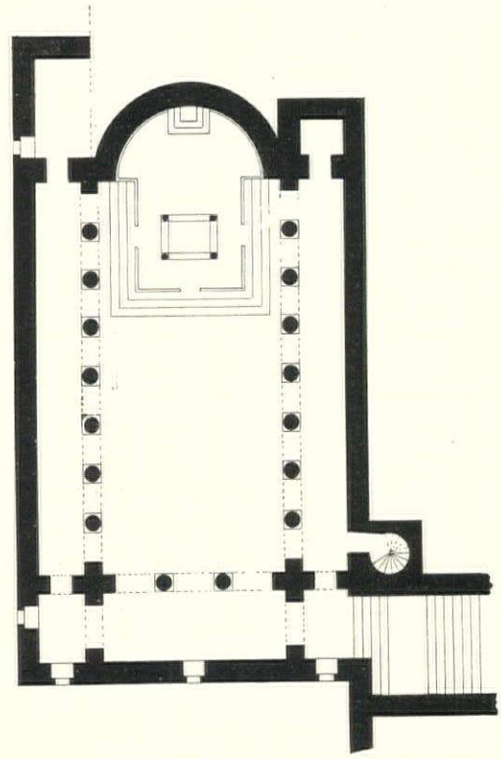


FIG. 21. STA. AGNESE WITHOUT THE WALLS, ROME (VII CENTURY).

two ranges of columns, and had a semicircular recess at the end, in which the judge sat in his chair, just as the bishop sat on his throne in the tribune of the ecclesiastical basilica; and, as the court-house of the Romans was known as the "basilica," or "house of authority," the ecclesiastical adaptation of it was popularly known by the same name.

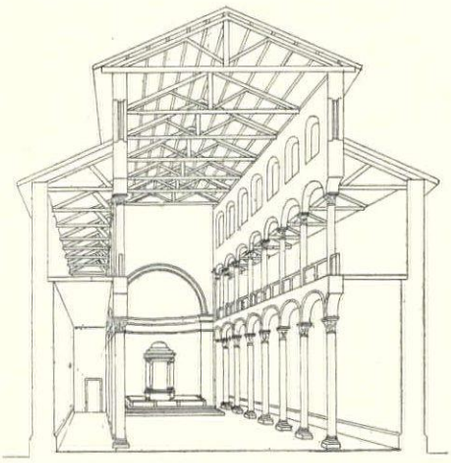
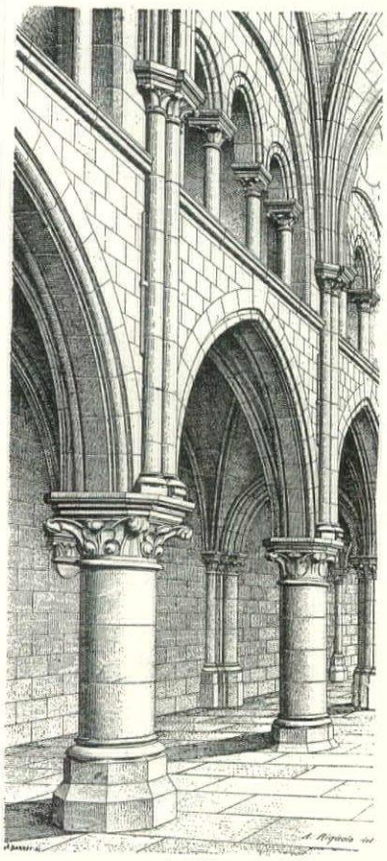


FIG. 22. STA. AGNESE WITHOUT THE WALLS, ROME; SHOWING ARRANGEMENT OF NAVE ARCADE, TRIFORIUM-GALLERY AND CLERESTORY WALLS.

As the attendants upon Christian worship then usually stood or knelt in the nave during the services, the aisles being reserved for processions or for other purpose, the two ranges of columns occasioned no inconvenience, and they supported walls (Fig. 21), which, rising above the roofs of the aisles on each side, afforded an opportunity for providing windows over the middle portion of the church, which would otherwise have been rather dark and ill-ventilated. In all these respects the requirements for a church were substantially the same as for a court-house; and even the altar in the tribune, on which the judges swore to exe-

[1]Continued from page 193, No. 1589.

cute justice, together with the steps which gave dignity to it, and to the seats of the clergy or court officials beside it, as well as the private rooms on each side of the tribune, and the "cancelli," or railings, which defended the occupants of the tribune from the crowd, and have given their name to the modern "chancel," were equally appropriate for judicial or ecclesiastical purposes.



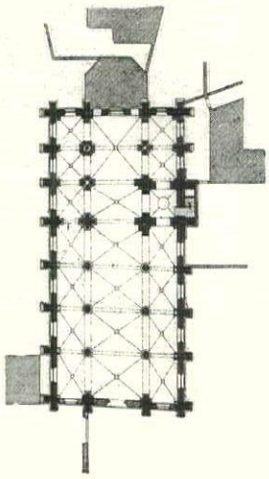


FIG. 23. CHURCH AT BAGNEUX, SHOWING MEDIÆVAL TRIFORIUM-GALLERY.

Even the galleries, which were frequently contrived in court-houses over the ceiling of the aisles (Fig. 22) for the use of women, who were not admitted to other portions of the building, were imitated in ecclesiastical basilicas for the same purpose, and, under the name of "triforium-galleries," which they afterwards received from the manner in which the openings in the front of them were often arranged, became an important feature of Gothic construction and design. (Fig 23.)

Before, however, the Italian basilica could be reproduced in such wild and undeveloped countries as France, England or Germany, it was necessary to make profound modifications in its construction. All over Italy the remains of antique buildings afforded quarries, from which columns, lintels for spanning the spaces between the columns, and bricks, for building arches and vaults, could be taken as desired; while the Italian peasants, who

FIG. 24. STA. MARIA IN TRASTEVERE, ROME: BUILT WITH ANTIQUE FRAGMENTS.

have been, ever since the Roman times, expert masons, could put the borrowed members together with such skill and taste that, even now, some of the Italian basilican churches, built of materials gathered from antique remains, deservedly excite our admiration. (Fig. 24.) North of the Alps these favorable circumstances did not exist. Except the remnants of the Roman military highways, there were no roads, and it was impracticable to transport large stones from the quarries over the trails, deep in mud, which formed the ordinary means of communication. Even bricks could hardly be procured outside of Italy, and the art of burning lime and making mortar was little understood, while the monks, although themselves intelligent and industrious, could

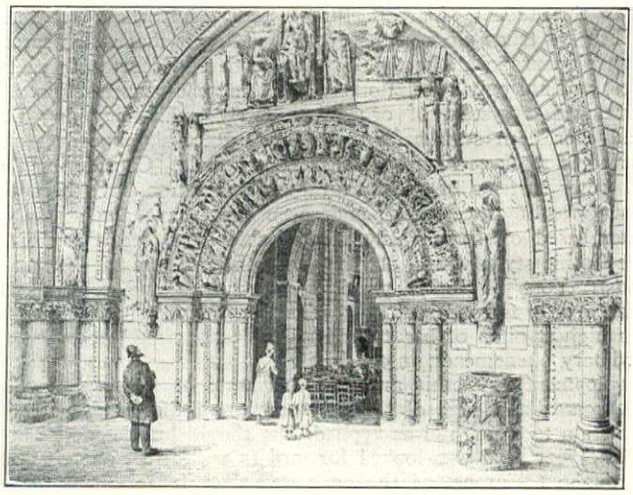


FIG. 25. ENTRANCE PORTALS: ST. OUR'S, LOCHES, FRANCE.

command very little steady labor except that of their own hands. It was necessary, therefore, before the earlier mission churches, which were generally of wood, could be replaced by something more spacious and enduring, to create a new system of building, suited to the use of small stones, sparingly used by a restricted number of workmen, and put together with soft and bad mortar;

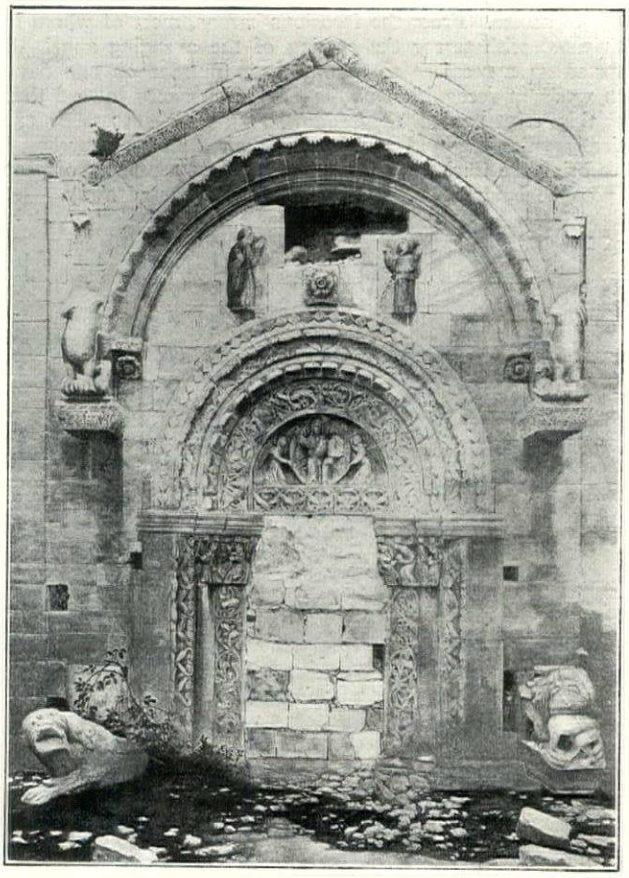


FIG. 26. ROMANESQUE DETAIL: CONVENT OF S. LIONARDO, APULIA ITALY.

and, at the same time, to adapt this system to the basilica type, which, both from its associations, and its suitability to the church services, it was desired to retain.

If the monks had needed only to accommodate themselves, their task would have been comparatively easy, but they were often obliged to build very large churches, to contain the multitude

of worshippers whom it was their constant endeavor to bring within their walls. Such buildings must have many and large

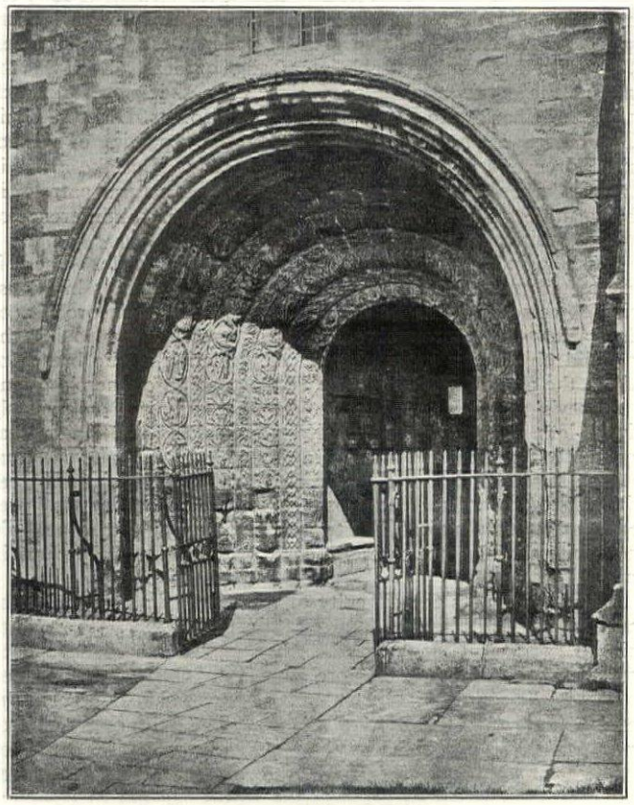


FIG. 27. PORCH: MALMESBURY ABBEY.

openings to give them light and air, and to permit the circulation of the people in them; and the only way in which such

FIG. 29. ROMAN GROINED VAULT: STA. MARIA DEGLI ANGELI, ROME: FORMERLY TEPIDARIUM OF BATHS OF DIOCLETIAN.

openings could be covered with the small stones which formed the only available material was by means of arches. The semi-circular arch was already familiar in Roman and Byzantine work, and the monks and lay brothers found no great difficulty in imitating the examples which most of them had seen. From this superficial imitation of the Roman work, the round-arched style of the eleventh and twelfth centuries still goes under the name of the "Romanesque," but the men who executed it were far from being servile copyists, and they ornamented their semi-circular arches with novel and beautiful sculpture. (Figs. 25, 26, 27.) They were, however, soon confronted by problems which the Roman construction did not enable them to solve. Most of the Roman arched work was built of bricks, and, in any case, was cemented with strong mortar, so that it required comparatively little buttressing, while the imperfectly cemented stones of the mediæval arches were free to push with nearly all their weight against their supporting piers, which they often pushed over. At the same time the frequent burning of churches made it desirable to render them incombustible, by covering as large a part of them as possible with a fireproof ceiling, for which stone was the only available material.

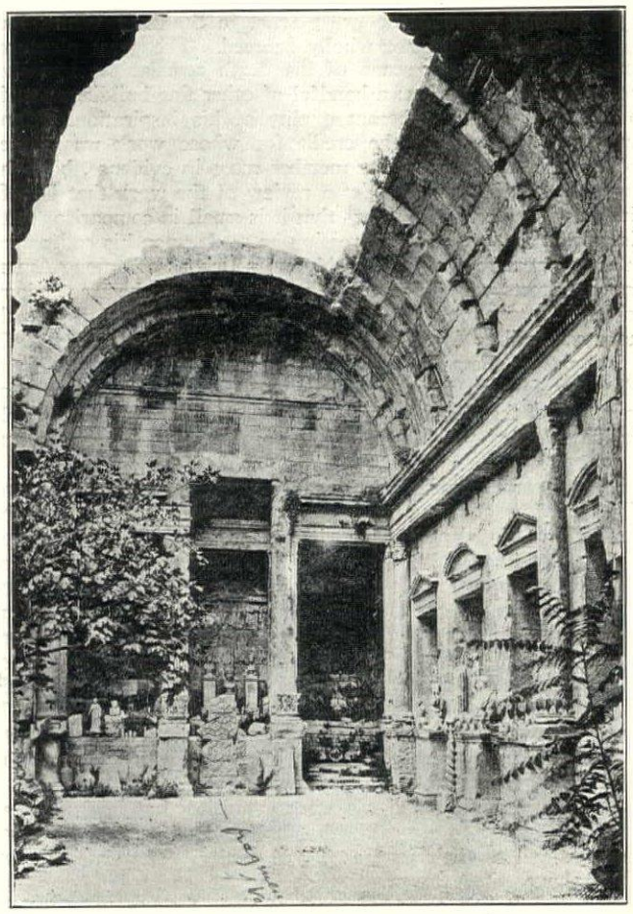


FIG. 28. ROMAN BARREL VAULT: HALL OF BATHS, NÎMES, FRANCE

The Romans had practised two methods of building fireproof ceilings. In one (Fig. 28) the room was covered with a continuous arch, which, if the apartment was long, was strengthened by ribs, the ribs and arch being both, after the usual Roman manner, of semicircular form. This type of ceiling is known as the "cradle," or "barrel" vault, and is open to the objection that, constituting a continuous arch, it exerts a continuous thrust, or horizontal push, upon the walls supporting it, which cannot be resisted by applying buttresses at intervals to the walls, leaving spaces for windows between them, but must be counteracted by making the whole wall of great thickness, piercing it only with small windows. Such a construction, although it was employed in many of the earlier monastic churches, made a heavy, gloomy and expensive building, and the monks soon attempted to replace it by an adaptation of the second type of Roman fireproof ceiling, known to us as the "groined vault." (Fig. 29.) This is, briefly, a barrel vault intersected by one or more similar barrel vaults, of the same width and height. When built over a square room, as in the figure, it is obvious that the weight of the vault is taken off the walls, and is concentrated at the corners of the room. The total weight and thrust of such a vault, although

differently distributed, are just the same as those of a barrel vault of the same dimensions, so that the corners, on which they are now concentrated, must be proportionately strengthened and buttressed; but, if this condition is complied with, the walls may be pierced with openings of any desired dimensions, or may be entirely removed, leaving the vault resting only on four corner piers. As this construction not only admits of wide windows, but allows them to be carried up to a level with the top of the vault, it had obvious advantages for church-building, and the monastic architects persistently endeavored to adapt it to their purposes. On a small scale this was not difficult, but to build a groined vault over a church nave was a different matter; and the problem was not solved with complete success until a change in the conditions of ecclesiastical architecture had given a new impetus to its study. T. M. CLARK.

(To be continued.)

THE ARTIST IN OUR WORLD.

THE follies of the time and his own frailties did everything possible to undo the great artist in Stanford White, but, fortunately, did not wholly succeed. The great pleasure-house which was the scene of his death remains an imposing monument to his genius; a handful of other fine buildings testify to the playful and exuberant quality of his inspiration. Many structures of the firm, the credit for whose work was rather indiscriminately given to the member most in evidence, bear the sign manual of his taste. Yet a review of the work that is definitely assignable to him shows that it is small in comparison with his powers and with the impression he made upon his colleagues. In actual creative quality, probably only Richardson among American architects was his equal. In physical force he was indomitable. On one occasion he rode all night over a detestable mountain trail to keep an appointment, having previously made a detour from New York to New Orleans to witness a prize-fight. Why was it that, with the energy and knowledge of the great architects of the Renaissance, and with a wealthy patronage fairly rivaling that of the Medici princes and popes, his work seems so incomplete and episodical?

Severe moralists will find the cause in his devotion to pleasure. Many another great artist, however, has been overmastered by the flesh, with no apparent detriment to his art. His colleagues explain that he was in a sense misplaced, being by temperament and gift rather a painter and decorator than an architect. But this does not really explain anything. It is the essence of genius to make its own opportunities, and his was genius of a very high order. An achievement that would be prodigious for a smaller man, is confessedly inadequate for him, and we surely have to do with a capital case of unutilized or even perverted energies. It seems to us that he was in a large degree the victim of the society which he sought above all else to please, to which he was the titular arbiter of taste.

His own æsthetic standards were exquisite; but insensibly, as he sold his taste to a wealthy but half-trained society, his taste condescended to their ignorance and vanity. The time that he should have given to creative design, he spent in despoiling French and Italian country-houses of their fittings and furnishings, and he adorned many an American mansion with irrelevant plunder of this sort. Enormously profitable as an incident to his profession, this traffic was naturally congenial to a passionate collector of every sort of art. The fallacy of the undertaking will be realized when it is noted that the shiploads of antiquities he furnished to his plutocratic clients contained very few objects above a respectable mediocrity, while he himself, perhaps the most-talked-of collector of our time, has left personal accumulations inferior to those of amateurs of far smaller wealth and opportunity. In other words, one has the tragic spectacle of a taste gradually adjusting itself to that of its market. He was immensely the superior of his world, but was content to be its purveyor. His career, as you choose to regard it, is that of a magnificent condottiere in architecture, who won brilliant skirmishes, avoiding the laborious operations of sieges and great campaigns; or of an æsthetic major domo to an opulent world whose especial vanity was the possession of fine works of art. Stanford White gave them quite as good as they deserved or wanted, but meantime, in such brokerage, the precious days were wasted that should have seen a succession of masterpieces from his hand.

We have thus dwelt upon this remarkable career because it is typical, illustrating with singular and pathetic emphasis the defects of art patronage among us. We believe it is the business of the artist to please his public, but it is also his privilege to educate his patrons. In the great periods of art the painter and his patron have met on something like equal terms; in fact, the man who paid the money has been very willing to learn from the artist. Between the two classes, under these circumstances, there was a lively and profitable interchange of ideas. Such was the case in the courts of Philip of Burgundy, the Emperor Maximilian, of Charles the Fifth, the Medicis, Sforzas, D'Estes, Louis the Fourteenth; such was the case in the republics of Athens and Florence, and in the Venetian oligarchy. But the artist in America who to-day addresses himself to his natural patrons in the wealthiest classes meets either a disheartening indifference or a more positively demoralizing vanity.

Possibly, indifference is the more insidious attitude. There is no greater enemy of the artist than the man who fills his house with objects of art, as he fills his greenhouses with orchids, or his stables with thoroughbreds, neither knowing nor loving the splendid objects his money buys. Appreciation is the breath of life to the artist. For him to be in the position of merely giving a money's worth is suicidal; to be habitually and consciously giving less is artistic death in life. Yet this is the danger that constantly threatens the artist in a day of indiscriminate accumulation. It was a danger that diverted and diminished the career of the great artist we have lost. With the arrogance that pretends to know, Stanford White was perfectly able to cope. To the vanity that did not care, but could pay lavishly, he became in part a victim.

His career points the difficulty of the *via media* that the artist must follow to succeed. A generation earlier or later, we are fain to hope, the flowering of such a genius would have been more normal, and the fruit more abundant. Our age has tended to debase the artist to its own standards, or to shut him up in the musky atmosphere of adoring cliques. The frittering away of great genius, as illustrated by the apparently successful career of Stanford White, is an exhortation to all true artists to master that most difficult art of being in the world, but not of it.—*New York Evening Post.*

COLOR IN STONEWORK.[1]—II.

THE best way of showing what this country produces in the line of colored stone suitable for structural purposes will be to classify the material roughly as to color, without regard to texture or lithological character. Doubtless some of the marbles named would be too expensive for use in the construction of entire walls (except in such a case as the Morgan library, where cost was not taken into account); but the purpose of this article is not to advocate the erection of buildings in solid colors, no matter how unusual; it is, rather, to urge a reasonable employment of colored stones for purely decorative effects and artistic contrasts. There is no stone mentioned but could readily and with fair economy be used for friezes, panels, columns, or ornamental details.

THE BROWNS.

Perhaps the most widely distributed of all the structural stones, classified as to color, are the brown sandstones. These have fallen into a measure of disrepute in Eastern cities, owing to their frequent disintegration in buildings. This defect is due largely to former ignorance in quarrying and carelessness in laying the stone. The rock was often shattered by blasting, or the cementing material was weakened by heavy sledging. Most of the stone is strongly laminated, and the necessity for laying it on its natural bed was not realized. Aside from this, one of the weakest of all the brownstones was the variety most widely used. In color these sandstones range through all the tints of brown, from a light gray-brown to a peculiar chocolate color that might almost be called purple. Of the latter variety is one of the brownstones from Hummelstown, Pa., as well as several from Wisconsin. The best known of all the stones of this class are those produced at Portland and Cromwell, Conn. Many millions of feet have been quarried in these two places. At East Longmeadow, Mass., several varieties of sandstone, ranging from light to dark brown, and including a red stone, have been produced for years and have proved extremely popular. The New Jersey brownstones are also famous. They are among the hardest to work, but are consequently more durable than many others. At Avondale and Belleville are found the so-called gray and dark brown varieties, and at Wilburtha is a light brown. The quarries at Little Falls, long since shut down, received the stamp of approval when their output found place in the walls and pinna-

[1]Continued from page 201, No. 1590.

cles of Trinity Church, New York. This structure has weathered well, all things considered, and has mellowed to a delightful tint. At Marquette and L'Anse, Mich., are brownstones similar in appearance to those of Connecticut. There is also a mottled variety, known in the trade as "Raindrop," as it presents an appearance as if sprinkled with drops of water. The Medina stone, from numerous quarries in Orleans and Niagara Counties, New York, is found in reddish-brown, gray, and mottled. It is extremely hard and durable. At Wadesboro and Sanford, N. C., quarries produce a good material of a shade between the bright red of the English and the dark brown of the New England stone. Killbuck, Ohio, has a dark gray and a dark brown stone. The Pennsylvania brownstones have received their fame through the output of the immense quarries at Hummelstown, Dauphin County, although similar material is found in other localities. These are among the best of all the brownstones as to uniformity and durability. As noted above, the darkest variety is of a purple tint. Wisconsin is also a brownstone state, with large quarries at Houghton, Bass Island, and Washburn, and many smaller ones scattered through the commonwealth. Mansfield, Ind., and Manassas, Va., also produce brownstones, although mainly for local use.

For certain classes of architectural work, especially in combination with a hard stone that will take a polish or an egg-shell finish, sandstone is unsuitable. The browns can be had in the denser materials as well. At Catskill, on the Hudson, there is quarried a very dense fossiliferous limestone that may be called a marble, inasmuch as it is partly crystalline and will take a polish. This is a dark brown in the mass, but it is enlivened by fossil shells and crinoid stems in white and pink. There is also found at Patterson, Putnam County, New York, a dolomitic marble, the general effect of which is brown. Structurally this is one of the best of American marbles. It is dense, finely crystalline, and so sound that it may be had in blocks of any size. It also weathers admirably. It has a large and diversified pattern, like tapestry, and together with streaks of white introduces tints of pink, dove-color, and purple. Owing to its pattern, it should be used in fairly large surfaces, or in columns. The brown Tennessee marble has been very widely used for polished interior work, but in sand-rubbed finish it would be suitable for exterior work, if it were needed for its color. The so-called St. Clair and St. Joe marbles of Arkansas are a fossiliferous rock in browns and reds. Along the Cedar River, near Charles City, in Iowa, is quarried a beautiful coral marble, known to the trade as "Madrepore marble." The body of this is a dark drab, with innumerable embedded fossils varying from yellowish to mahogany brown. A very finely crystallized marble at Beulah, Col., is found in body-tints of brown, from liver-color to chocolate, streaked and spotted with brilliant reds and yellows. The deposit is not sound and large pieces could not be had, but in small masses it would be very effective in decoration. In Arizona there is an immense deposit of a dense liver-colored rock, of a texture similar to lithographic stone. It is given the name of "Olympian marble," although it has none of the characteristics of a true marble except that it will take a high polish. It occurs in more than twenty distinct colors and tints, largely browns, reds, drabs and yellows. The cost of transportation would prevent any free use of this, but owing to the amazing variety of color and the fact that it is almost entirely non-absorbent, consequently long retaining a polish, it might prove a valuable material for panels and other bits of out-of-doors decorative work.

THE REDS AND PINKS.

Among the sandstones, the reds and pinks are closely akin to the browns and grays, and are often found in the closest association with the latter. For a time the red sandstones were largely imported from England and Scotland, but it was soon found that they would not withstand the severities of the American climate. They crumbled to dust, and a few years would completely destroy all character in a richly carved front. Architects were the more ready to discard this imported material, desirable as the colors were, when it was found that our native quarries could match the foreign stones in color, and in a rock that was far more durable. Portage Entry, Mich., and East Longmeadow, Mass., produce excellent red stones, the former almost identical in tint with the English and Scotch stones, and the latter in bright and dark reds, even more warm in coloring. The "Garden of the Gods" owes its wonderful color-effects to the beds of red Triassic sandstone that form the ramparts of the Grand Cañon of the Colorado. Some of this is friable, but good weathering stone can be had at Stout, Arkins, and Lyons, Col. Some of this could not be told in tint and texture, except by the closest examination, from the famous Dumfries sandstone, and it is far more durable. Pennsylvania produces a good red sandstone at Laurel Run and White Haven. In Minnesota there is a red stone of medium texture at New Ulm, Fond du Lac, and Sault Ste. Marie. The Potsdam sandstone of New York has been referred to above. This varies from salmon-pink to red. Owing to its close texture and enormous crushing-strength, it has been pronounced by some authorities as one of the best of American structural stones. Of much the same geological formation is the quartzite or commercial "jasper" of Sioux Falls, S. D. It is extremely hard and will take a brilliant and lasting polish. It is preeminently a stone for out-of-doors decoration. This also covers the tints from pink to red, and some of it is streaked with purple. Along the Kettle River, in Pine County, Minn., is quarried a sandstone that is a perfect salmon-pink tint. This can be had in blocks of any size, suitable even for Cyclopean masonry.

According to our present knowledge, the occurrences of pink limestone are limited. This variety of stone is found at Kasota and Winona, Minn. It is of pure salmon-pink color, and it has lately been found that it will take a soft polish, giving an admirable effect in decoration. The stone is being used effectively for the interior adornment of the new Minnesota State Capitol, but it is equally suitable for exterior use.

In red and pink marbles we have not such a varied array as the Old World. But, as a rule, the American stone is much sounder than that from European quarries, and hence more available for the purposes contemplated in this article. Georgia marble is a coarse-grained stone, notable for its non-absorbent qualities. Hence it weathers admirably. The "Etowah" variety is perfectly sound, ranging in tint from salmon to rose-pink. That it will withstand the severest assaults of the weather has been abundantly proved, and thus one of the most desirable of all colors for exterior work is made available. The extremely hard "Champlain" marbles, quarried at Swanton, Vt., and Mallet's Bay, N. Y., occur in various shades of pink, as well as in a true Pompeian red. The Tennessee pink, to which reference has been made, is almost white unless polished. A notable use of this material, in addition to the Morgan library, is in the statues on the New York Custom-house. The St. Clair and St. Joe marbles, of Arkansas, mentioned among the browns, are also to be had in reds. In the Jenny Jump Mountain, in Warren County, N. J., there is a beautiful rose crystal marble, almost unique in its brilliance. It has not been quarried commercially, as yet, but it would doubtless be developed if interest were aroused in it.

Pipestone, or Catlinite, the peculiar mineral of which the Indians made their ceremonial pipes, occurs in considerable quantities in Pipestone County, Minn. The deposit is too seamy to produce large blocks, but in small pieces it would furnish an effective color for decoration.

When one comes to the granites, there is an imposing array in the reds and pinks. It is impossible to classify all of the separate occurrences. A great many of the Maine granites have a distinct pink tint, but they are always regarded as grays, except where the color becomes more vivid, as in the stone from Red Beach and from Jonesboro. This granite is fine-grained, and is a favorite for columns and polished work. Rhode Island furnishes from its big quarries at Westerly what the trade regards as the standard granite. One of the varieties is a medium-grained red-and-white mottled stone of peculiar beauty. Red and pink are found in the stone from Leete's Island, Conn., which is coarsely porphyritic in structure. The Stony Creek granite, from the same State, has commended itself by the fact that it has a bold and distinct pattern. Its effect in egg-shell finish can be seen in the pedestal of the Sherman statue on the Fifth Avenue Plaza, New York. The Milford pink, from Massachusetts, is too well known to need description. It is almost a gray, and would not give much contrast to the ordinary light building stones. A red, coarsely-porphyritic granite is that from Warwick and Pine Island, in Orange County, New York; and Grindstone Island, St. Lawrence County, also has a stone of somewhat similar texture, but deeper red, and taking a high polish. East St. Cloud, Minn., yields a red granite, and at Granite City, Okla., there is a stone of a particularly deep and warm color.

From Graniteville and Syenite, Mo., comes a coarse red granite, or syenite. This takes a high polish, and can be had in blocks of immense size. Wisconsin, too, is noted as a granite State, and especially for its reds and pinks. At Montello there is a dense, fine-grained red and a chocolate red. The latter has been greatly admired in the sarcophagi holding the remains of General and Mrs. Grant. At Waushara is a purple-speckled stone, and at Granite City one similar in color, but of finer grain. The Waupaca granite is an extremely bright and vivid red, mottled with yellow, and porphyritic in formation. In the same area there is deep grayish-pink, speckled with black, also porphyritic. It would scarcely be an exaggeration to call the Wausau granite an ox-blood in color, for it is the most brilliant stone of its class in the country. The stone is fine-grained, and is speckled with white quartz. There is also a delicate pink-gray, marked with black. The Berlin rhyolite is a deep, velvety purple, almost black, with fine streakings of white. There are deep red granites in Burnet County, Texas, but they have not been extensively developed as yet. At Faith and Salisbury, N. C., there is a very fine-grained stone, of a genuine flesh-pink color. It is one of the strongest stones ever tested by the United States Government. A peculiarity is the remarkable facility with which it can be split. The writer has seen pieces broken off the ledges only eight inches square and from eighteen to twenty feet in length, to be used for posts.

A granite has recently come into the market from Pompton, N. J., that is unique. It is coarsely porphyritic, the feldspar and quartz being in large patches. In color it is pink, mottled with light green and white. The pattern is, perhaps, the boldest of all American granites. A peculiar effect, owing to the size of the feldspar crystals, is that the stone is distinctly chatoyant in spots. FRANCIS W. HOYT.

(To be continued.)

ILLUSTRATIONS

RENAISSANCE CAPITAL: PLATES 57-64

NEW MADISON-SQUARE PRESBYTERIAN CHURCH, NEW YORK, N. Y. MESSRS. M'KIM, MEAD & WHITE

This building, which to the irreverent is, because of its form and the colored and glazed terra-cotta work which clothes its walls and roofs, already known as the "Church of the Holy Stein," is one of the last buildings to receive the careful consideration of the late Stanford White. Its harmonies of coloring and gradation of texture are so nearly wholly satisfactory that it is likely to be named hereafter as one of the best as well as the latest of the artist's achievements.

SOUTH TRANSEPT OF THE SAME.

DETAIL OF FRONT PORCH OF THE SAME

DETAIL OF SOUTH TRANSEPT: ST. PAUL'S CHAPEL, COLUMBIA UNIVERSITY, NEW YORK, N. Y. MESSRS. HOWELLS & STOKES, ARCHITECTS, NEW YORK, N. Y.

Additional Illustrations in the International Edition.

DETAIL OF PORTICO: ST. PAUL'S CHAPEL, COLUMBIA UNIVERSITY, NEW YORK, N. Y. MESSRS. HOWELLS & STOKES, ARCHITECTS.

NOTES AND CLIPPINGS

ITALIAN ANTIQUES AND THE PACCA LAW.—The American Consul at Messina has recently reported upon the regulations of the Italian Customs authorities affecting antiques, which are of special interest to tourists in Italy. According to the regulations now in force all goods coming from Taormina in Sicily, for shipment to any foreign port, upon arrival at the Italian Custom-house in Messina must be sent at the shippers' expense to the museum either at Palermo or Syracuse for examination by experts to discover if the cases contain any antiques. The declaration that they do not contain such articles carries no weight whatever. If an antique is found which comes under the law forbidding its exportation it is seized. If it is of a class that can be exported by payment of an export duty it is released when that requirement is complied with. If, however, this article be found in a package which was entered for exportation upon a declaration stating that no antiques were contained therein the shipper is subject to a fine which may amount to as much as £30. The Consul quotes a case in point in which an artist who had lived at Taormina and who on his departure packed all his belongings and sent them to Messina for shipment. He declared the contents as household effects. When examined there were found numerous antiques of Italian origin but of little value and which were not all purchased in Italy. The authorities decided that they could be exported upon payment of the duty, but that he must pay the fine for false declaration. For this reason it would be well for visitors to Taormina to be warned of the existing conditions. The antiquarian who sells a piece of old furniture will naturally not find it to his interest to inform his customer of the regulations and, therefore, the Consul suggests that the only safe method for the purchaser to pursue would be to stipulate that payment be only made when the bills of lading of the steamer on which his goods are shipped are placed in his hands. Complaints have frequently been made by purchasers who, only too late, discovered that even after they had paid for their goods they could not export them. The conditions at present are such that a person not conversant with the law may purchase a genuine antique from a dealer only to discover that the exportation of his purchase is actually prohibited, and his only recourse is to make a legal claim against the seller, which is a most expensive proceeding.—*Journal of the Society of Arts.*

THE HAMBURG BISMARCK MONUMENT.—The statue which the citizens of Hamburg have just erected to the memory of Prince Bismarck differs widely from most of the monuments reared in honor of the great chancellor. The significance of it was explained in a speech delivered at the unveiling ceremony by Senator Dr. Mönckberg, who said: "The pictures of Prince Bismarck which represent him as a great statesman and diplomatist, or as a powerful speaker, or in his well-known Cuirassier uniform, show us only one side of the great man. The picture which we unveil to-day is, however, to show the whole Bismarck as he will live in the hearts of Germans when centuries have blotted out all that is incidental and external in his appearance. Such a picture must embody the great qualities and mighty ideas, as the possessor of which Prince Bismarck will be admired and venerated for all time." The monument is a massive and imposing structure built on the Elbhöhe, and approached by a large number of steps. The vast pedestal is circular in shape, composed of layers of granite blocks, and decorated at intervals in the circumference with allegorical figures. The figure itself which is to commemorate, not the dead Bismarck, but Bismarck as he will live in myths of future generations, takes the form of Roland standing in stately majesty, folding his hands over the hilt of his huge sword, which reaches from his chest to the ground in front of him. To the right and left of his feet are two great eagles watching on either side, while he gazes into the future. The figure itself is fifty feet in height, and the whole monument is constructed from enormous granite blocks from the Black Forest.—*New York Evening Post.*

SPANISH SANS CULOTTES.—Signor Ruiz Jimines, governor of Madrid, was recently struck by a philanthropic idea of gigantic proportions. Policemen by the score were sent out to catch the unwary and have them placed in institutions established for their benefit. Within a few weeks every "home" was filled to its last place by these rich but unhappy beggars. And still the streets of Madrid were not empty of these pious mendicants. There still were enough to go around and to spare. For a moment Signor Jimines was in despair as to what to do next. He was still bent upon carrying out his purpose, but it seemed well-nigh impossible of realization. Here another brilliant idea struck him. He ventured upon a bold move. He desired to set the more muscular of his guests to work on the public buildings and canals which are at present being built in and around Madrid. But the governor did not know his men. They, too, had developed a theory, which was destined to frustrate the governor's well-laid plans. One day as his deputies came to take the men from the "home" to the public works, they were met at the doorsteps by one of the feebler inmates who politely announced that his honored colleagues were entirely unable to go to work. The deputies insisted that they must carry out the governor's orders, and forced their way into the building. There they were met by eighty-six able-bodied men all dressed in the garb of Adam before the fall, vigorously asserting that the world owed them a living without their working for it. "If you want to kill us," they said, "you can do so. Work we will not. You see the pile of ashes there? It's all that remains of our clothes. You see we can't work to-day. You had better tell the governor to try something easier."—*Boston Transcript.*

The American Architect and Building News

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SOCIETIES, PERSONAL MENTION, ETC. iv

A SUIT that promised to be of considerable importance to the profession, since both parties gave every indication of a determination to carry it before a court of last resort, if needful, has been settled out of court and in favor of the architect plaintiff. The case of Hull *vs.* the City of New York promised to become a leading case, one which would be of great use in making known how far obligations incurred by the ever-changing body of public officials may safely be ignored or rescinded by their successors in office. There can be no question that a municipality may rightfully abrogate any contract, but it cannot at the same time annul a contract and void its own liability for breach of such contract, although municipal officials are much given to thinking this can be done. Considering that it only required the writing of an "opinion" by the city's Corporation Counsel, Mr. Delaney, to induce the Comptroller to pay over to Mr. Hull the fifteen thousand dollars claimed for work done upon the now rejected design for the Brooklyn Municipal Building, the public cannot have a very high opinion of the intelligence of those other officials who were apparently willing to test in court their belief that an architect may win an important public competition, may in consequence become one of the parties to a formal contract for the execution of his design, may spend much time and money in preparing drawings and specifications in preparation for the builder's contract, may then find himself and his work "turned down" at the whim of a newly elected official, and yet have no valid claim of any kind upon the city's treasury.

THE New York Municipal Art Commission deserves commendation for nothing in a higher degree than for the determined stand it has taken in the matter of the new bridge-work that falls under its jurisdiction, and it is entirely right in holding that these grand engineering undertakings, in spite of their primal utilitarian purpose, count for so much in the landscape effect that really large sums of money may justifiably be consumed in securing, not strength nor mere viability, but grace and interest of general design and detail. The Commission has lately given a shock to those public officials who seem to think that the whole purpose of things is to enable them to take part in "opening ceremonies," by declining to approve the design for the Hendrik Hudson Memorial Bridge that is to span Spuyten Duyvil Creek and connect the Riverside Drive with the boulevard system of the Bronx. The official mind was anxious to have the bridge finished so that it might be opened in the autumn of 1909, at the time of the Hudson-Fulton celebration, scheduled for that date, and was prepared to spend on it the five and a half millions of dollars called for by the estimates, but naturally balks at the idea of spending twelve millions, which the Bridge Commissioner, evincing what is probably merely a snap judgment, says would have to be spent if the Municipal Art Commission's ideas should be carried out. If there is an actual difference of seven millions between the cost of the two ways of dealing with a really good opportunity, we should say that the real inference to be drawn is merely that the cheaper scheme must be a rankly improper and impossible one to be carried out as a permanent improvement of one of the wealthiest cities in the world.

ALTHOUGH the powers of the Municipal Art Commission—which, by the way, are not such as to enable it to prepare and originate schemes for improvement—have precise geographical limitations, we may hope that its chastening influence at least may extend as far as the Highlands of the Navesink, where, as part and parcel of the same Hudson-Fulton anniversary celebration, it is proposed to erect an extraordinary monument four hundred feet high and crowned with a statue of Hudson measuring another hundred feet. Upon this structure, which it is said will require three years in the building and the interior arrangement of which has not yet been decided upon—for the reason, obviously, that no one can devise a use for such a structure erected in such a place—it is proposed to spend from seven hundred thousand to a million dollars.

THE always interesting matter of the "proper charge" is brought up in the last issue of *The Architect* in such a way as to make us wonder whether American practice recognizes the procedure that seems to prevail in England. We believe that American architects are content to compute their commission as five per cent. of the total cost to the owner of all labor and material consumed in the construction of a building, and shown by the architect's certificates to be the cost of such building—including extras—as viewed by the contract. This custom of ours, if we are right in thinking it to be such, seems to lose sight of one point that is covered in English practice, for *The Architect* declares that it is

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there "generally believed" that an architect may properly charge a commission of two and a half per cent. on work called for by drawings and specifications and actually included in the contract price, but which the owner, during the progress of the work, has decided to have omitted. The careful schedules prepared by the quantity-surveyor make it easy enough for the English practitioner to ascertain the value of omissions of all kinds and the proper fee to charge; but, under our larger and more lavish way of doing things, this is not so easy a thing to do, when the omissions are of comparatively trivial extent, and we fancy that no consistent system of coping with the situation is recognized here; and so it may be useful to know what English practice and precedent can be cited at need. In the case under discussion by *The Architect,* the judge declared he could not allow any charge to be made for a commission on omitted work, seeing that, owing to the introduction of extras, the actual cost of the building had been nearly double that stated in the contract, as a consequence of which the architect had already been paid much more than was anticipated when he undertook to serve his client—a piece of reasoning which only an English judge could be capable of working out to his own satisfaction.

WE have no personal knowledge of the conditions, as to violation of the city's building-laws, that have prevailed in the great department-store of Marshall Field, in Chicago, where, on Saturday last, the establishment was for a few hours closed to the public at the order of Building Commissioner Bartzen, because the management had refrained from complying with repeated orders to conform with the building ordinances. We have several times pointed out how seriously the frequenters of, and employés in, these great establishments were imperilled by the frequent ill-planning, poor construction and worse misuse of these buildings, and so we are sincerely glad that the Chicago incident has occurred, as it may indicate the beginning of a needed reform.

THE New York *Sun* makes happy use of a racing term when it says that there "may be some welchers among the fire-insurance companies," which just now are being made the victims of Californian political demagogues, and then goes on to show that the delay, or even refusal, to pay losses due to the San Francisco disaster is not enough to justify the inclusion in the brotherhood of welchers—men who refuse to pay gambling obligations, of the ethical validity of which there is no doubt—of all insurance companies which find themselves constrained to take this unpopular stand. As the *Sun* says, "insurance companies are not organizations for the distribution of charity," but can disburse the companies' money only "in accordance with the contracts into which they have entered;" and if among the conditions of such contracts there are any which forbid the paying of losses due in any way to earthquake, it is not only unjust, but unreasonable, that attempts should be made to injure their standing as useful and law-abiding institutions. If there must be suspicions of welching, it is consolatory to learn that American companies are not the only ones that are attracting to themselves an undesirable attention. Just now, it is alleged that a certain Austrian company, long established, powerful and supposed to be reputable, has not offered to adjust its losses, and even does not admit its liability, and this in face of the fact that its policies are of the "standard" form and do not contain any exempting earthquake clause.

THE San Francisco disaster has distributed its tribulations with lavish and far-reaching hand, but one would hardly expect to find the coke-burners in Pennsylvania being aggrieved because of it. Yet they had to forego their usual Fourth of July holiday, as Mr. Frick issued the order to "keep the ovens going; the coke is needed." The incident is only symptomatic of the unusual stress that has been imposed on the structural-steel business everywhere. It is usual, even when trade is active, to close down the steel works for a fortnight, at least, during the heated season, partly to give the men time to recuperate and partly to enable the mechanicians to give the plant an annual overhauling. But this year the U. S. Steel Corporation notified the fifteen thousand hands employed in its McKeesport plant that, instead of a fortnight's rest, they could have only a single week, and later still further reduced this meagre rest to a four-day siesta. In the same way the Jones & Loughlin concern, at Pittsburgh, notified their hands that they must do without their anticipated two weeks' holiday.

AN international exhibition having an announced and final purpose, or rather a lasting result, in view is rather a novelty, and the Municipal Council of Rome can claim the merit of inventing such a scheme. In 1911 is to be celebrated the fiftieth anniversary of Rome as the modern capital of Italy, and it is proposed to signalize the international exhibition that is to be held there at that time not only by "unveiling" the great national monument to Victor Emmanuel, but by completing restorations of the Circus Maximus, the Baths of Antoninus, and the Colosseum! How far the antiquarian world will relish the idea of seeing these venerable ruins put in spick-and-span order as part of "a Roman holiday" may easily be guessed. However, as an appropriation of only twelve hundred thousand dollars seems to be in view, the "restoration" may not be so very trying.

IF not actually apocryphal, the comment of a certain Herman Fisher, of Tompkinsville, Staten Island, should hereafter be found in every anthology of American humor. "Tell her," said he, whispering a message for his wife, "that we will have plenty of spare cash next week. You know this is 'overtime,' and I get two dollars an hour for it." For twenty-two hours, friends and neighbors had been working desperately to prevent his being further engulfed by the clay and quicksand that poured in from all sides of the excavation in which he had been at work, and where the first avalanche had nearly buried him beyond chance of rescue, and yet, in spite of his mental torment and physical exhaustion, he had presence of mind enough at last to disguise a stronger feeling by cracking a joke.

CONCRETE COLUMN TESTS AT THE WATERTOWN ARSENAL, MASS.[1]

TESTS on cements, mortars and concretes, which have been in progress during the past six years at the Watertown Arsenal, have reached the subject of columns. Of these, ninety-nine have been tested, others have been made and await being tested, while still others of the series are yet to be made.

The tests embrace columns of different mixtures, ranging from neat cement to those of very lean mixtures, both plain and reinforced with longitudinal bars imbedded therein, or by the several current methods of external lateral reinforcement, consisting of hoops and other means, and also by the combined action of hoops and longitudinal bars. Reinforcing material has been received from the Expanded Metal Companies, the Hennebique Construction Company, the Trussed Concrete Steel Company, the Cummings Structural Concrete Company, and the Clinton Wire Cloth Company.

In general the dimensions of the columns are 8 feet in height and from 10 inches to 12 inches in diameter. They are made in molds, excepting a number of those having expanded-metal cages which were covered with finer mesh lathing, in a vertical position, of wet mixtures, and harden in the air.

They are tested in a horizontal position. For purposes of transportation, adjustment in the testing-machine, and to secure even bearing surfaces, they are built upon iron plates and capped with the same. Side rods with turnbuckles are used to put the columns under sufficient initial compression to permit of being handled.

During testing the columns are loaded with increments of 50 pounds per square inch, measuring the amount of compression under each increment, returning to the initial load and observing the sets. Micrometer observations are thus made on a gauged length of 50 inches, equidistant from the ends of the columns.

Full details are published in *"Tests of Metals,"* a Congressional document, issued by the Ordnance Department, U. S. Army.

The following tables give the principal features of tests which have been made since the last published report, of 1905. These results, in detail, will appear later in *"Tests of Metals,* 1906."

In presenting tests reaching up to the time of this meeting, necessarily little opportunity has been available for comparisons and deductions. Indeed, since the series is by no means completed, extended deductions should be held in abeyance. Certain features of interest, however, have been developed and will be referred to, for the illustration of which a number of diagrams have been prepared.

On Diagram No. 1 are represented the compressive strengths of some mortar columns, plain and reinforced with longitudinal bars of ¾-inch twisted steel. The progressive loss in strength of the plain columns, as the mixtures become leaner, will be noted. The ultimate strength of the 1:1 column was not reached. It exceeded the capacity of the testing-machine. This mixture was not reinforced. Each of the others was reinforced, four with 8 bars each and one with 13. The percentage of reinforcement was about 2.86 and 4.63, the darker shaded lower ends of the figures representing the relative amounts.

The steel reinforcing bars extended from end to end of the columns, and came to a full bearing against the compression platforms of the testing-machine. They were used without other lateral support than that which was afforded by the mortar in which they were imbedded. These reinforced columns would be classified as strong columns, according to current practice.

Diagram No. 2 shows the strength of a rich and a lean mortar, each of which was reinforced with hoops and longitudinal angle-bars; also, corresponding concretes, reinforced. The hoops measured 1:5 by 0:12 in cross section, lapped and riveted joints. The plain 1:1 mortar displayed a compressive strength of 4,320 pounds per square inch, which in the hooped column rose to 5,980 pounds. The addition of two parts trap rock to this mortar resulted in a strength of 5,433 pounds. This loss in strength, by the addition of stone to a mortar, is not peculiar to this example. It has occurred in a number of cases.

The weaker 1:4 mortar was raised by the hooping and angles

CONCRETE AND MORTAR COLUMN TESTS AT WATERTOWN ARSENAL, MADE SUBSEQUENT TO LAST PUBLISHED RESULTS, IN "TESTS OF METALS, 1905." COLUMNS EIGHT FEET HIGH.

TABLE NO. I.

No. of Test	Diameter of Column	Composition				Age		Reinforcing Metal	Gross Sectional Area	Weight of Concrete or Mortar per Cubic Foot	Compressive Strength	
		Cement	Sand	Stone or Cinder	Kind of Stone or Cinder						Total	Per Sq. Inch
	Inches					Mos.	Days		Sq. Ins.	Pounds	Pounds	Pounds
1718	12.35	1	2	4	¾" to 1½" trap rock	5	8	2" mesh wire cage	119.79	149.8	263,538	2,200
1722	12.25	1	2	4	¾" " 1½" "	5	13	3" " "	117.86	151.3	242,000	2,053
1724	12.45	1	2	4	¾" " 1½" "	5	13	3" " "	121.74	149.4	318,000	2,610
1720	12.25	1	3	6	¾" " 1½" "	5	8	2" " "	117.86	150.1	159,111	1,350
1719	12.45	1	3	6	¾" " 1½" "	5	8	2" " "	121.74	145.7	168,000	1,380
1721.	12.40	1	3	6	¾" " 1½" "	5	8	2" " "	120.76	143.1	183,500	1,520
1723	12.34	1	3	6	¾" " 1½" "	5	12	3" " "	119.60	147.6	197,340	1,650
1725	12.35	1	3	6	¾" " 1½" "	5	11	3" " "	119.79	149.6	206,000	1,720
1734	10.40	1	1	0	None	6	11	None	84.95	132.6	367,000	4,320
1735	10.40	1	1	0	"	6	12	25 1.5" hoops and 4 angles	84.95	132.6	508,000	5,980
1730	10.45	1	1	2	¾" to 1½" trap rock	5	0	25 1.5" " " "	85.77	149.1	466,000	5,433
1736	10.38	1	4	0	None	6	8	None	84.62	118.7	88,851	1,050
1737	10.40	1	4	0	"	6	8	25 1.5" hoops and 4 angles	84.95	119.9	235,000	2,766
1733	10.40	1	4	8	¾" to 1½" trap rock	6	11	25 1.5" " " "	84.95	146.6	255,000	3,002
1731	10.40	1	2	4	¾" " 1½" "	5	16	None	84.95	150.0	120,000	1,413
1740	10.38	1	2	4	¾" " 1½" "	6	6	13 1.5" hoops	84.62	149.2	188,900	2,232
1741	10.38	1	2	4	¾" " 1½" "	6	5	25 1.5" "	84.62	148.6	290,100	3,428
1739	10.35	1	2	4	¾" " 1½" "	6	6	47 1.5" "	84.13	149.4	445,000	5,289
1738	10.38	1	2	4	¾" " 1½" "	6	7	13 1.5" hoops and 4 angles	84.62	150.7	256,300	3,029
1692	10.40	1	2	4	¾" " 1½" "	0	15	25 1.5" " " "	84.95	144.2	260,400	3,065
1726	10.30	1	2	4	¾" " 1½" "	5	12	25 1.5" " " "	83.32	150.7	349,000	4,189
1728	12.00*	1	2	4	¾" " 1½" "	5	12	25 1.5" " " "	113.10	149.4	370,000	3,271
1746	10.36	1	2	4	¾" " ¾" "	5	12	48 1" " " "	84.30	147.2	324,000	3,843
1744	11.95*	1	2	4	¾" " ¾" "	6	0	48 1" " " "	112.16	148.2	335,200	2,989
1732	10.38	1	3	6	¾" " 1½" "	5	11	None	84.62	148.2	63,465	750
**1742	10.38	1	3	6	¾" " 1½" "	6	4	25 1.5" hoops	84.62	145.9	162,300	1,918
1743	10.38	1	3	6	Cinders	6	4	25 1.5" "	84.62	101.3	96,000	1,134
1727	10.35	1	3	6	¾" " 1½" "	5	11	25 1.5" " and 4 angles	84.13	148.3	325,000	3,863
1729	12.02*	1	3	6	¾" " 1½" "	5	3	25 1.5" " " "	113.47	144.6	299,000	2,634
1747	10.36	1	3	6	¾" " ¾" "	5	11	48 1" " " "	84.30	138.9	212,000	2,515
1745	11.95	1	3	6	¾" " ¾" "	5	13	48 1" " " "	112.16	142.2	259,000	2,309
1714	12.00	1	2	4	¾" trap rock	5	11	3 Kahn bars and 11 hoops	113.10	145.4	265,500	2,350
1717	12.00	1	2	4	¾" "	5	8	3 " " " "	113.10	145.6	237,510	2,100
1712	12.45 X 12.47	1	2	4	¾" "	5	11	4 " " " "	155.25	143.4	270,450	1,800
1713	12.45 X 12.47	1	2	4	¾" "	5	11	4 " " " "	155.25	144.6	394,000	2,538
1716	12.48 X 12.49	1	2	4	¾" "	5	10	4 " " " "	155.88	143.8	296,172	1,900
1715	12.45 X 12.49	1	2	4	¾" "	5	10	4 Truscon bars and 11 hoops	155.50	145.8	367,500	2,363
1705	12.02	1	3	6	¾" to 1½" trap rock	5	5	None	113.47	146.1	164,100	1,446
1706	12.02	1	3	6	¾" " 1½" pebbles	5	3	"	113.47	128.0	143,000	1,260
1707	12.00	1	3	6	Cinders	5	0	"	113.10	101.4	78,900	698

* Exterior shell.
** Column No. 1742 was defective; one hoop was displaced during construction.

[1] Paper by James E. Howard, read at the June, 1906, Meeting of the American Society for Testing Materials.

from 1,050 pounds to 2,766 pounds, which in the corresponding concrete reached an ultimate strength of 3,002 pounds. The free span between the hoops, 2½ inches, permitted this lean mortar to flake off, while the larger pieces of stone in the concrete were retained in place.

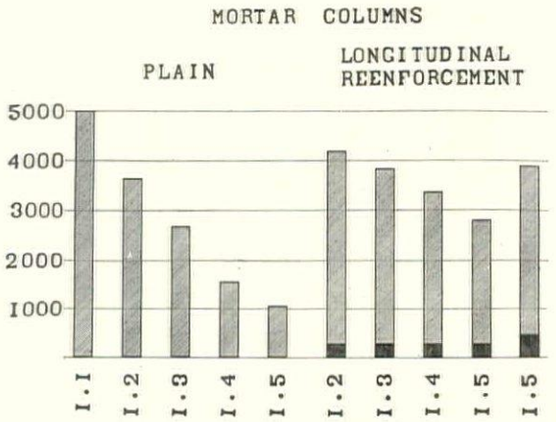

DIAGRAM NO. 1.

bars. The compressive strengths of this group are as follows:

Plain column	1,413	pounds per	sq. inch.
13 hoops	2,232	"	"
13 hoops and 4 angle-bars,	3,029	"	"
25 hoops	3,428	"	"
25 hoops and 4 angle-bars,	4,189	"	"
47 hoops	5,289	"	"

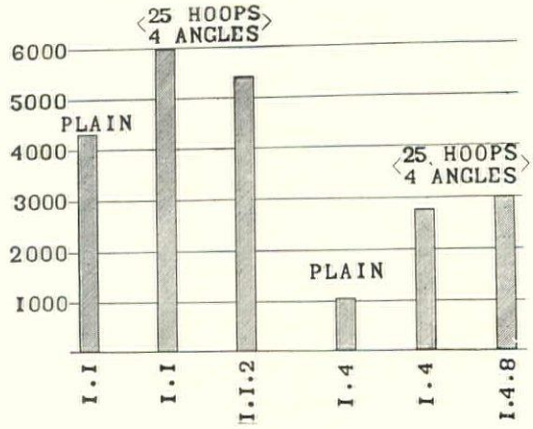

DIAGRAM NO. 2.

TABLE NO. 2.

No. of Test	Brand of Cement	Sectional Area: Gross	Sectional Area: Concrete or Mortar	Sectional Area: Longitudinal Bars	Metal in longitudinal Bars of Column	Description of Reinforcement
		Sq. ins.	*Sq. ins.*	*Sq. ins.*	*Per Cent.*	
1718	Alpha	119.79	119.79	None	.....	2" mesh steel wire cage. 48 circular wires, .104" diameter, electrically-welded ends; 19 longitudinal wires, .104" diameter, electrically-welded intersections.
1722	"	117.86	117.86	"	.....	3" mesh steel wire cage. 33 circular and 13 longitudinal wires, each .104" diameter, with electrically-welded ends and intersections.
1724	"	121.74	121.74	"	.....	3" mesh steel wire cage. 33 circular .145" diameter wires; 13 longitudinal .104" diameter wires; electrically-welded ends and intersections.
1720	"	117.86	117.86	"	.....	2" mesh steel wire cage. 49 circular .104" diameter wires; 19 longitudinal .104" diameter wires; electrically-welded ends and intersections.
1719	"	121.74	121.74	"	.....	2" mesh steel wire cage. 49 circular .144" diameter wires; 19 longitudinal .104" diameter wires; electrically-welded ends and intersections.
1721	"	120.76	120.76	"	.....	2" mesh steel wire cage. 49 circular .144" diameter wires; 19 longitudinal .104" diameter wires; electrically-welded ends and intersections.
1723	"	119.60	119.60	"	.....	3" mesh steel wire cage. 33 circular and 13 longitudinal .104" diameter wires, with electrically-welded ends and intersections.
1725	"	119.79	119.79	"	.....	3" mesh steel wire cage. 33 circular .145" diameter wires; 13 longitudinal .104" diameter wires; electrically-welded ends and intersections.
1734	"	84.95	84.95	"	.....	None.
1735	"	84.95	84.04	.91	1.07	25 hoops, 1.5" wide by .12" thick by 10" inside diameter, and 4 steel angle-bars, each 1" x 1" x ⅛".
1730	"	85.77	84.86	.91	1.06	25 hoops, 1.5" wide by .12" thick by 10" inside diameter, and 4 steel angle-bars, each 1" x 1" x ⅛".
1736	"	84.62	84.62	None	.....	None.
1737	"	84.95	84.04	.91	1.07	25 hoops, 1.5" wide by .12" thick by 10" inside diameter, and 4 steel angle-bars, each 1" x 1" x ⅛".
1733	"	84.95	84.04	.91	1.07	25 hoops, 1.5" wide by .12" thick by 10" inside diameter, and 4 steel angle-bars, each 1" x 1" x ⅛".
1731	"	84.95	84.95	None	.....	None.
1740	"	84.62	84.62	"	.....	13 hoops, 1.5" wide by .12" thick by 10" inside diameter.
1741	"	84.62	84.62	"	.....	25 hoops, 1.5" wide by .12" thick by 10" inside diameter.
1739	"	84.13	84.13	"	.....	47 hoops, 1.5" wide by .12" thick by 10" inside diameter.
1738	"	84.62	83.71	.91	1.08	13 hoops, 1.5" wide by .12" thick by 10" inside diameter, and 4 steel angle-bars, each 1" x 1" x ⅛".
1692	"	84.95	84.04	.91	1.07	25 hoops, 1.5" wide by .12" thick by 10" inside diameter, and 4 steel angle-bars, each 1" x 1" x ⅛".
1726	"	83.32	82.41	.91	1.09	25 hoops, 1.5" wide by .12" thick by 10" inside diameter, and 4 steel angle-bars, each 1" x 1" x ⅛".
1728	"	113.10	112.19	.91	0.80	25 hoops, 1.5" wide by .12" thick by 10" inside diameter, and 4 steel angle-bars, each 1" x 1" x ⅛".
1746	"	84.30	83.39	.91	1.08	48 hoops, 1.04" wide by .06" thick by 10" inside diameter, and 4 steel angle-bars, each 1" x 1" x ⅛".
1744	"	112.16	111.25	.91	0.81	48 hoops, 1.04" wide by .06" thick by 10" inside diameter, and 4 steel angle-bars, each 1" x 1" x ⅛".
1732	"	84.62	84.62	None	.....	None.
1742	"	84.62	84.62	"	.....	25 hoops, 1.5" wide by .12" thick by 10" inside diameter.
1743	"	84.62	84.62	"	.....	25 hoops, 1.5" wide by .12" thick by 10" inside diameter.
1727	"	84.13	83.22	.91	1.08	25 hoops, 1.5" wide by .12" thick by 10" inside diameter, and 4 steel angle-bars, each 1" x 1" x ⅛".
1729	"	113.47	112.56	.91	0.80	25 hoops, 1.5" wide by .12" thick by 10" inside diameter, and 4 steel angle-bars, each 1" x 1" x ⅛".
1747	"	84.30	83.39	.91	1.08	48 hoops, 1.06" wide by .06" thick by 10" inside diameter, and 4 steel angle-bars, each 1" x 1" x ⅛".
1745	"	112.16	111.25	.91	0.81	48 hoops, 1.04" wide by .06" thick by 10" inside diameter, and 4 steel angle-bars, each 1" x 1" x ⅛".
1714	"	113.10	111.37	1.73	1.53	3 Kahn bars, .76" x .76" stems, with prongs bent inward at angle of 45° to axis, embraced by 11 hoops of ⅜" wire.
1717	"	113.10	111.37	1.73	1.53	3 Kahn bars, .76" x .76" stems, with prongs bent inward at angle of 45° to axis, embraced by 1 hoop of ⅜" wire.
1712	"	155.25	152.94	2.31	1.49	4 Kahn bars, .76" x .76" stems, with prongs bent inward at angle of 45° to axis, embraced by 11 hoops of ⅜" wire.
1713	"	155.25	152.94	2.31	1.49	4 Kahn bars, .76" x .76" stems, with prongs bent inward at angle of 90° to axis, embraced by 11 hoops of ⅜" wire.
1716	"	155.88	153.57	2.31	1.48	4 Kahn bars, .76" x .76" stems, with prongs bent inward at angle of 90° to axis.
1715	"	155.50	153.69	1.81	1.16	4 Truscon bars, .76" diameter each, embraced by 11 hoops of ⅜" wire.
1705	"	113.47	113.47	None	.....	None.
1706	"	113.47	113.47	"	.....	"
1707	"	113.10	113.10	"	.....	"

On the diagram which next follows, No. 3, the several columns were of the same composition, namely, 1:2:4 mixtures.

This diagram is intended to illustrate the effect of hooping alone, and with the further reinforcement of longitudinal angle

Thus it appears that the hoops and angles each contribute toward increasing the ultimate strength of the columns.

The question of ultimate strength only is now referred to, considering the gain effected by means of lateral reinforcement.

It will be shown presently that rigidity of shape does not advance in corresponding degree with the gain in compressive strength. This is regarded as an important feature, not to be overlooked in judging of the advantages of exterior lateral support as compared with longitudinal reinforcement, or the gain in both strength

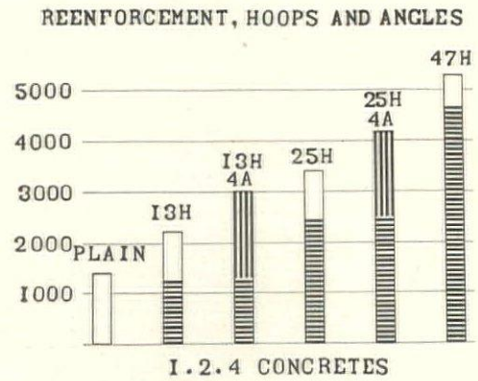

DIAGRAM NO. 3.

and rigidity which accompanies the use of rich cement mixtures. Any desired strength may be attained by means of lateral reinforcement, if sufficient metal is used, but it is obvious that a certain amount of longitudinal compression of the concrete will be necessary before the lateral reinforcement becomes effective, which, in the case of lean mixtures, involves a large direct compressive movement of the column.

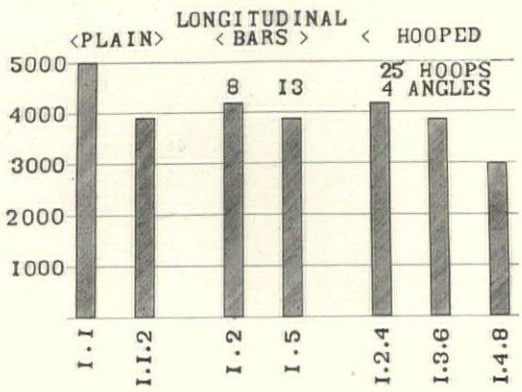

DIAGRAM NO. 4.

On Diagram No. 4 are represented several columns which are strong by reason of their composition or on account of their reinforcement. In composition, reinforcement and strength they are described as follows:

1:1 mortar, plain	above	5,011 lbs. per sq. in.
1:1:2 concrete, plain		3,900 " " "
1:2 mortar, 8-¾" twisted steel bars		4,200 " " "
1:5 mortar, 13-¾" twisted steel bars		3,905 " " "
1:2:4 concrete, 25 hoops and 4 angle-bars		4,189 " " "
1:3:6 concrete, 25 hoops and 4 angle-bars		3,862 " " "
1:4:8 concrete, 25 hoops and 4 angle-bars		3,002 " " "

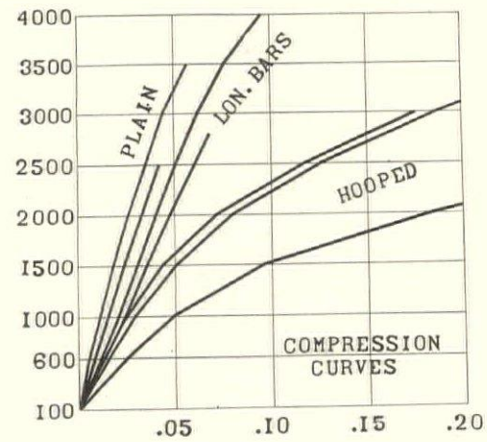

DIAGRAM NO. 5.

The relative rigidity of these columns, a feature not suggested by a comparison of their compressive strengths, is indicated on Diagram No. 5, which next follows.

The order in which the compression-curves appear is the same as the figures on Diagram No. 4, excepting the 1:1 mortar and the 1:1:2 concrete change places, the latter appearing first on the left of this group.

As may be noted, the plain columns display the greatest rigidity of the several types here represented. This has been a noticeable feature in the tests as a whole.

It is even found that plain columns are a little more rigid, over the range of stresses here plotted, then the same mixtures in which longitudinal bars are used as the means of reinforcement. In so many cases has this occurred that some explanation should be sought why the presence of the steel bars, themselves so much more rigid than the concrete, should not result in increased rigidity of the column as a whole. It is not improbable that the settlement in height of the column is so far restricted by the steel bars that minute fissures are developed during the early stages of hardening of the concrete. Internal strains, without the presence of fissures, would hardly account for this behavior.

The difference between the plain and the longitudinally reinforced columns is not great, however, in this respect.

The hooped columns are a distinct group, and decidedly more compressible than the others. Comparisons are now being made between columns of different mixtures, and, it may be added, the leanest mixtures are expected to display the greatest compressibility. However, lateral reinforcement, while effective in raising the ultimate strength for loads once applied, does not result in imparting rigidity to a weak concrete. The value of lateral reinforcement, as a method of raising the limit of endurance against long-continued or repeated stresses, is a query suggested by an inspection of these curves.

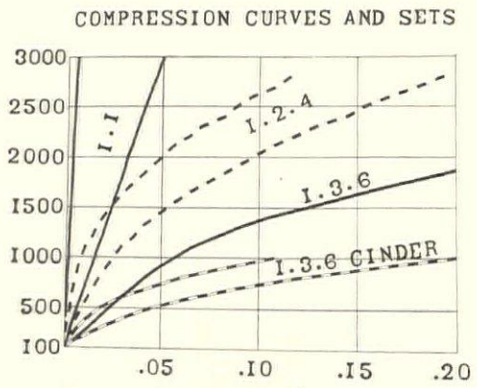

DIAGRAM NO. 6.

Diagram No. 6 is introduced merely to show the range in compressibility which is experienced, and the sets developed, in different mixtures. The several curves refer to hooped columns, excepting the 1:1 mortar. They are plotted because of their greater strength over the plain mixtures, but the curves are similar in their characteristics.

The moduli of elasticity at successive stages, referring to values over a range of 500 pounds per square inch next above the initial

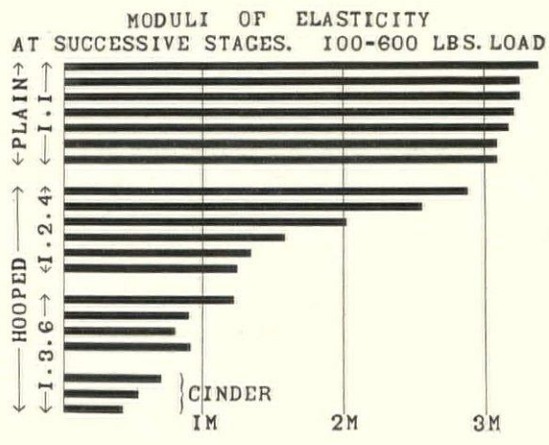

DIAGRAM NO. 7.

load, are shown on Diagram No. 7. In obtaining these values the columns were loaded with successive higher stresses and then returned to the range from 100 to 600 pounds, at which time the

micrometer observations were made. The numerical values were as follows:

1:1 Mortar, Plain.

Original value of E.....		3,378,000 lbs. per sq. in.
After a load of	1,000 pounds,	3,247,000 " " "
" " " "	1,500 "	3,247,000 " " "
" " " "	2,000 "	3,205,000 " " "
" " " "	2,500 "	3,165,000 " " "
" " " "	3,000 "	3,086,000 " " "
" " " "	3,500 "	3,086,000 " " "

1:2:4 Concrete, 25 Hoops.

Original value of E.....		2,874,000 lbs. per sq. in.
After a load of	1,000 pounds,	2,551,000 " " "
" " " "	1,500 "	2,016,000 " " "
" " " "	2,000 "	1,582,000 " " "
" " " "	2,500 "	1,337,000 " " "
" " " "	2,800 "	1,244,000 " " "

1:3:6 Concrete, 48 Light Hoops, 4 Angle-Bars.

Original value of E.....		1,220,000 lbs. per sq. in.
After a load of	1,000 pounds,	899,000 " " "
" " " "	1,500 "	801,000 " " "
" " " "	2,000 "	912,000 " " "

1:3:6 Concrete, Cinder, 25 Hoops.

Original value of E.....		702,000 lbs. per sq. in.
After a load of	850 pounds,	538,000 " " "
" " " "	1,000 "	4 26,000 " " "

Neat cement and rich mortars do not show any considerable loss in the value of the modulus of elasticity when examined over an early range of loads succeeding the application of successively higher stresses.

Other mixtures are subject to decided changes. After the application of each higher load there results a difference in the rate of compressibility under lower stresses, the modulus in some instances dropping to less than one-half its original value. It will be understood from this that the proportion of load carried by steel in combination with concrete is subject to great fluctuations. This feature will deserve consideration in the case of reinforced beams, when they are studied in the manner in which the present column tests are being carried out.

It may be remarked in passing that compressive stresses exceeding 50,000 pounds per square inch are of frequent occurrence in columns tested to their ultimate resistance, whence it follows that steel employed for longitudinal reinforcement should have an elastic limit not less than the above.

In addition to the changes in the modulus above referred to, the curves of ascending and descending stresses do not coincide, the departure increasing with the application of successively higher loads. This behavior is indicated upon Diagram No. 8, which shows the stress-strain curves of four columns.

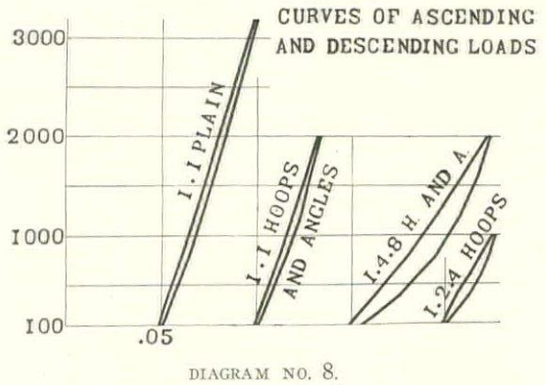

DIAGRAM NO. 8.

These curves were obtained after the columns had been loaded as follows:

1:1 mortar, plain, after having been loaded with....	3,500	lbs. per sq. in.
1:1 mortar, 25 hoops and 4 angle bars, after having been loaded with.....	5,700	" " "
1:4:8 concrete, 25 hoops and 4 angle-bars, after having been loaded with.....	2,500	" " "
1:2:4 concrete, 25 hoops, after having been loaded with	3,200	" " "

Concerning the amount of lateral expansion which accompanies the direct compression of the material, observations have been made on several columns. Measurements have also been made upon the expansion of the hoops of hooped columns during testing. Adjacent hoops have been found working under very different strains. The location of final rupture in unreinforced columns is often indicated prior to reaching the maximum load, by reason of the greater lateral expansion in that vicinity.

Columns have been made for test by long-continued loads, and are now sustaining stresses of different amounts. The loads are maintained by means of groups of steel bolts which tighten end plates, between which the columns are located.

In conclusion, it is believed that the present tests are sufficiently advanced to clearly indicate that high ultimate strength may be reached by each of the three current methods of practice; that is, by the use of rich mortars or concretes, by means of sufficient longitudinal metal reinforcement, and by means of adequate hooping or other external lateral support. Rigidity of the columns will be attained by the use of rich cement mixtures or by means of longitudinal steel bars. The rigidity of the mortar or concrete itself is effected practically only by the use of rich cement mixtures. Economy of cost, to attain compressive strength, within certain limits, will be promoted generally by the plentiful use of cement.

THE INVENTOR OF REINFORCED-CONCRETE.

IN 1854 Mr. W. B. Wilkinson, "a plasterer and manufacturer of artificial stones," of Newcastle-on-Tyne, took out a patent for fire-resisting construction in which the fundamental principles of modern reinforced-concrete construction are embodied. Not only does this patent cover the reinforcement of floor slabs with crossing iron bars, but it shows how to reinforce concrete girders or beams to sustain these floor slabs. It is plain from the patent specification that Mr. Wilkinson clearly understood the subject, and had practically investigated the principles involved. His was no blind leap in the dark, and it seems that he must be acclaimed as the real inventor of modern reinforced-concrete, where the metal is only introduced to strengthen the concrete in tension, designed on a scientific basis. This patent also is the first to suggest the construction of tubular partitions with keyed joints. He founded the firm of W. B. Wilkinson & Co., Ltd., of Newcastle-on-Tyne, which is well known for its work in plain and reinforced-concrete to-day. We are informed by this firm that some years ago a fire unfortunately occurred at their offices and destroyed all the old books and papers, so that the particulars of early contracts (of which many important ones are known to have been carried out in the 'sixties and 'seventies), executed by the firm have been lost. The following is an abstract of Wilkinson's patent specification (dated October 27th, 1854, and sealed April 3d, 1855):

"In constructing the floors of dwelling houses or warehouses, formed during the progress of the building with ceilings of an arched form, the walls of the building are to be carried up to the requisite height for the first floor; a centering is then to be firmly fixed over the whole area intended to be floored and boarded with narrow strips, leaving a small space between each, if the ceiling be for a dwelling house, and very slightly nailed, to keep them in position. The material to form the floor and ceiling is composed of crushed bricks, metallic scoria, or other hard substances (which, however, must be free from soil or other extraneous matter), and Portland or other cement of equal quality. These materials may be mixed together in the proportions of three parts of crushed hard-burnt bricks and scoria, sifted through a riddle of about 2-in. mesh, one part of hammer-broken stones or bricks, or other hard substances, reduced to about the size of 2 ins. diameter, one part of the same material hammer-broken and reduced to about the size of a quarter brick; the whole is then to be well incorporated. The three parts of 2-in. scoria and burnt bricks are then mixed with water, to which are afterwards added two parts of the coarser material, the whole being well worked together with the cement to produce perfect adhesion. This mixture when ready is thrown onto the centering, and beaten in solid, the coarser portions in the haunches and the finer parts toward the crown of the arch. As the larger portions of the broken brick, etc., would not lie conveniently over the crown of the arch, where the thickness is much less than at the haunches, a number of strips of hoop-iron laid on edge are imbedded in the mass across the crown of the arch, at distances of about 2 feet asunder, or at greater or less distances according to the desired strength of the floor, and reaching the full length across the floor or floors, the under edge of the same being set at or near the crown of the centering, so that in this low position the strips may act with more power as tension-rods to the floor. The concrete is filled up to the desired level, and if for dwelling houses or warehouses for the storage of light goods it may be troweled smooth and finished in cement, or laid with boards. If a wood floor is desired, strips of wood may be imbedded or dovetailed into the cement, to which strips the flooring boards are nailed. When the first floor has been formed, it must be protected from injury by being covered with thin deals, laid on

a stratum of sifted sand, which will assist in keeping the concrete moist for a longer period than if it were exposed to the free action of the air, slow drying adding greatly to its strength and durability. The centering should not be removed until the concrete has become sufficiently set, which will be at the expiration of about a month, the walls of the next story having been built in the meantime to act as an abutment to the arch. The rest of the floors as well as the roof may be constructed in a similar manner, care being taken to give a sufficient rise to the middle of the roof, to throw off the wet into a channel or gutter at the front and back; or, if preferred, a slated roof may be put on the top in the usual manner. . . . The floors formed in the manner hereinbefore described will admit of brick partitions being set upon them in positions where a wooden floor would not admit of. The peculiar construction and arrangement of these partitions will be hereinafter more particularly described and referred to. The stairs may be of stone, or of the same material as the floors, which will be considerably cheaper and as good. . . . For warehouses the arch and supporting walls are made of additional strength. When ceilings of arch form may be objected to, and when it may be necessary to execute work with dispatch, as in putting in new floors to old buildings, in place of the method hereinbefore described a flat platform of wood is to be erected to the ceiling line, and the floor to be composed of plaster, air-slacked lime, cut hay, and ashes and breeze in certain proportions, and wire rope (which may be procured second-hand in considerable quantities), or iron in other forms in a state of tension, hollow bricks, field drain-pipes, coke in lumps, etc., being introduced, if desired, to lessen the weight. The wire rope is secured at its extremities at each line of support by imbedding it in the mixture or concrete while in a soft state, and forming the ends into loops, or by opening out the strands and hirling them in various directions, which renders it so secure as not to be drawn out under any force short of the breaking weight of the rope. In ordinary dwelling houses I propose placing such wire ropes about 9 ins. apart, and to have a full depth of floor of one-sixteenth the span; so that for a span of 16 ft. I should have a flooring of 1 ft. in depth, the breaking weight of which is calculated at 21-2 tons per superficial yard. . . .In lieu of the ordinary lath and plaster, these partitions are composed of Paris plaster alone, or of plaster-of-Paris and air-slacked lime, cast in blocks of a cellular form. The cavities or cells run horizontally, and the blocks are dovetailed together at the joints, and united with strong gauged plaster-of-paris and lime, putty, or air-slacked lime; they are set fair and dressed with scrapers, forming a surface suitable either for paint or paper. This partition may be used on ordinary wooden floors, and is not more heavy or expensive than lath-and-plaster partitions. In some cases this partition may be supported on a beam composed of wire ropes, plaster, cut hay, etc., as shown."

In 1855 M. François Coignet, of Paris, took out patents in both France and England. Whereas the French patent only dealt with the making of concrete from hydraulic limes and various aggregates, the English patent included reference to the construction of reinforced-concrete floors. It was not until 1858 that he obtained the extension of his French patent which describes his system of reinforced-concrete.

In 1867 Monier took out a patent in France. M. Monier has been acclaimed as the pioneer of reinforced-concrete, but we see that he was antedated by several others. Even in 1867 Monier had not realized the possibility of using his invention for structural work. The 1867 patent is for strengthening concrete flower-pots with a wire mesh. It was not until 1873 that he took out an extension of the patent to cover its use for reservoirs, bridges etc. In 1879 Monier exhibited his system in the Antwerp Exhibition, where Herr G. A. Wayss noticed it and bought the German patents. Experiments were carried out, the system thoroughly studied, and its use pushed with vigor.—*The Builders' Journal*

ONE WAY TO RETAIN A LAWYER.

June 28, 1906.

To the Editors of the American Architect:

Dear Sirs:—At the last meeting of the N. Y. Chapter of the A. I. A. a committee was appointed to select a lawyer to perform some special work of importance to the Chapter. The choice of this lawyer from among the eminent members of the legal profession will not be without its difficulties, and it is not impossible that some of the members of the committee may have some young and talented relation or friend who is a lawyer and whom he wishes to see placed in a prominent position in the legal profession.

As a member of the Chapter, I have suggested to its Executive Committee that instructions be given to its special committee to send out to all the leading lawyers of the country a circular similar to that inclosed, in so doing following the lead of the Trustees of one of our well known Institutions of Learning, who in this instance acted under the advice of the Profesosr of Architecture of one of our principal Universities, they being apparently upheld in their conceptions of propriety by four eminent architects who have agreed to enter the competition for a modest honorarium, less than sufficient to cover one-half of their expenses, and by two architects of the highest position and probity who have agreed to act with the Professor Adviser as a jury to award the prize.

I ask you to spare some of your valuable space for the reproduction of this proposed programme as the surest means of bringing it to the attention of my fellow practitioners, with whom I should like to advise; for as I read it over I find myself questioning whether the eminent lawyers, to whom this programme should be sent, would consider it complimentary to be asked to enter such a competition, and whether the members of the Executive Committee, who promulgated it, might not be considered by the lawyers to have offered an affront to the dignity of the legal profession.

In the interests of brevity I have omitted certain relatively unimportant sections from the original draft.

Yours very truly,

Henry Rutgers Marshall.

THE PROGRAMME OF A COMPETITION

FOR THE SELECTION OF A LAWYER, AND THE PROCURING OF A GENERAL OUTLINE OF PROPER PROCEDURE TO BE ADOPTED BY THE NEW YORK CHAPTER OF THE AMERICAN INSTITUTE OF ARCHITECTS IN THEIR DEALINGS WITH IMPORTANT CORPORATIONS.

The Project. 1. The members of the New York Chapter of the A. I. A., finding their relations with a prominent corporation unsatisfactory, wish to provide themselves with a new form of contract to be executed between themselves as clients and the corporations they serve. In order to gain this end it is necessary to determine upon a general course of action, although only a special action is necessitated at present.

2. The Chapter has appointed a special committee with authority to establish a competition, and through it to procure a formulation of the said general course of action, and in accordance therewith to proceed with the special action necessitated at the present time.

3. The committee is constituted as follows: (Here to follow the names of the special committee.)

4. To carry the above purposes into effect, the committee has established this competition among lawyers.

5. ————, Professor of Law in the University of ———— has been appointed by the committee as its consulting lawyer, to prepare this programme and act as adviser in the conduct of the competition.

The Programme. 6. The terms of the competition are set forth in this programme, which constitutes the agreement between the committee on the one hand and each competitor and the appointed lawyer, severally, on the other.

7. These terms will not be modified in any respect which seems to the committee to be important, without the consent of at least two-thirds of the competitors, but additional information will be issued as necessary.

8. Communications upon the above may be addressed in writing either to the committee or to the adviser. Such communications should be anonymous. Replies will be sent in writing simultaneously by the committee to each competitor, and will thereupon become an essential part of the programme.

9. Relates to dates.

10. As used in this programme, the word "lawyer" or "author" means the single competitor, whether a legal firm or individual practitioner; "committee," the special committee appointed by the New York Chapter of the A. I. A. above referred to, and "the lawyer" or the "appointed lawyer" means the lawyer awarded the prize of competition and appointed as lawyer of the work to be undertaken.

11. ————

The Competition. 12. Competitors. Four lawyers have accepted the committee's invitation to submit briefs in the competition [let us say Guthrie, Crevath & Henderson; Chas. C. Burlingham; Cary & Whitridge, and Strong & Cadwallader], all of New York.

13. The committee desires also the participation of other lawyers of the best professional standing and of experience in the guidance of large enterprises. Those who may desire to take part are requested to apply for admission upon blank forms to be had upon application to the Secretary of the committee, and the committee will extend to approved applicants an invitation to submit briefs as below referred to.

14. **Competition Fees:** For their services in submitting briefs in this competition, a fee of one hundred dollars ($100) will be paid to each of the four especially invited lawyers, and to each of those other four competitors whose briefs rank highest among those selected by the jury as hereafter provided.

15. **The Prize:** The prize of the competition will be the retention of the winner to undertake the special legal work necessary in connection with the special action taken under the formulation of the general course of action referred to in Sections 1 and 2.

16. This prize will be awarded to that competitor whose brief is designated by the committee as "premiated," as provided below.

17. **The Competitive Brief.** Inasmuch as it is impossible to secure in competition a brief covering the course of action to be taken by the New York Chapter in all details, and under all circumstances, the committee states that it desires and expects to receive in this competition a carefully studied outline of a general mode of procedure only, whose special characteristic should be clearly indicated in the competitive brief and which shall realize in practice the requirements of this programme.

18 to 29. Several sections describing the method of presenting briefs with unmarked sealed envelopes containing the names of authors.

30. **General.** No competitor may submit more than one brief, which must conform strictly to the programme requirements.

31. **Anonymity of Authorship.** No nom de plume or symbol, or any other identifying name or mark, is to appear upon the wrapper in which briefs are delivered. Nor shall any competitor, either directly or indirectly, reveal the idenity of his brief to, or seek to influence in his favor, any member of the committee or the jury.

32 to 34. Relate to delivery of competitive briefs.

35. **Receipt of Briefs.** Briefs so delivered will first be removed from their wrappings by an assistant to the committee, and the committee will then receive and give to each brief and to the sealed envelope accompanying it, a number by which they will be known until after the awards have been made.

36. The sealed envelopes will then be placed in the custody of the Secretary of the committee and will not be opened until after the awards have been determined.

37. The legal adviser will then examine the briefs and any which do not conform to the programme will, upon his recommendation, be placed out of the competition by the committee.

38. **The Judgment.** The remaining briefs will then be laid before a jury of three composed of [say, Joseph H. Choate, Wm. B. Hornblower] and the committee's legal adviser, Prof. ———.

39. After careful examination of these remaining briefs, the jury will select that one which in its opinion gives promise of the best result when carefully developed in all its parts and details, and will recommend it to the committee for their choice as the "Premiated Brief." In making this selection the jury will hold the brief to define the professional and legal capacity of its author for dealing with this especial problem, as it may be regarded from all points of view.

40. The jury will then select from among the remaining briefs those seven which are best; will rate them in the order of their merit, and will report such selection and rating to the committee.

41. ———

42. ———

43. **The Awards.** The committee will then, after careful consideration of the aforesaid report, and after examination of the briefs with their legal adviser's assistance, take action by selecting that brief which may in its opinion be best, and will designate said brief as "Premiated"; will thereupon open the envelope containing the name of its author and will forthwith award him the prize of competition by designating and appointing him their legal adviser to conduct the general work described in the programme.

44. The committee will then open the remaining envelopes and will award to those four lawyers (other than any of the four especially invited) whose briefs rank highest among the eight selected by the jury, a fee of one hundred dollars ($100) each.

45. With the winner of the competition the committee will make a contract to perform the service necessary in relation to the special action to be taken at the present time, for which service he is to receive a fee over and above his necessary disbursements, which shall not exceed the sum of one thousand six hundred dollars ($1,600).* If the appointed lawyer be among those especially invited, his fee shall be considered as a payment on account of the above-mentioned full fee as the committee's legal adviser.

46 ff would contain details of the matter in relation to which the legal advice is required.

*In the competition referred to in my letter, the total profit to the architect employed can certainly not be expected to amount to more than sixteen times the amount to be paid to each invited competitor.

ILLUSTRATIONS

HOUSE OF MRS. JAMES M. GREEN, NO. 1737 MASSACHUSETTS AVE., WASHINGTON, D. C. MR. APPLETON P. CLARK, JR., ARCHITECT, WASHINGTON, D. C.

DESIGN FOR THE NATIONAL SCHOOL OF FINE ARTS, RIO DE JANEIRO, BRAZIL. SENHOR A. MORALES DE LOS RIOS. ARCHITECT.

GRACE CHURCH NEIGHBORHOOD HOUSE, NEW YORK, N. Y. MESSRS. RENWICK, ASPINWALL & TUCKER, ARCHITECTS, NEW YORK, N. Y.

PLANS OF THE SAME.

PENNSYLVANIA R. R. TERMINAL STATION: CENTRAL PAVILION, NEW YORK, N. Y. MESSRS. M'KIM, MEAD & WHITE, ARCHITECTS, NEW YORK, N. Y.

EAST END OF GENERAL WAITING-ROOM IN SAME STATION.

ADIRONDACK LODGE FOR WILLIAM A. READ, ESQ. MESSRS. DAVIS, M'GRATH & SHEPARD, ARCHITECTS, NEW YORK, N. Y.

PLANS AND SIDE ELEVATION OF THE SAME.

Additional Illustrations in the International Edition.

DOORWAY: HOUSE OF MRS. JAMES M. GREEN, WASHINGTON, D. C. MR. APPLETON P. CLARK, JR., ARCHITECT.

NOTES AND CLIPPINGS

Building Falls in Hamburg.—A building in course of construction at Hamburg, Germany, fell June 18. Six workmen were taken out dead, thirteen were injured. The disaster is attributed to the light steel used in the building.

The Egyptians and Diamond Drills and Saws.—We have been flattering ourselves that during the last quarter of a century the application of the diamond and corundum to stone-working had not only revolutionized the industry, but had brought entirely new methods into play. But "there is nothing new under the sun." There seems to be no doubt that in addition to tools of iron, steel and bronze, the early Egyptian workmen, at least 4,000 years ago, used tools similar to the diamond drills and diamond saws popularly supposed to be among the latest inventions of our day. It is not certain that the diamond was the material used, but it is quite certain that the Egyptians were acquainted with some cutting material which was much harder than quartz and used it as a cutting point in the same way we use the diamond today. This is proved by specimens of ancient work in which are found tubular drill holes varying from a quarter of an inch to five inches in diameter, and of the cores cut from them. But the most interesting piece of evidence is a slab of diorite found at Memphis bearing equi-distant and regular grooves of circular arcs parallel to each other. The only possible explanation of this is that it was produced by a circular saw in which were mounted cutting points of some exceedingly hard material. It would be interesting to know how the points were mounted in these ancient saws because the great difficulty in the modern diamond saw has been to retain the diamond in position, and this has been especially so in the case of the harder stones like granite and syenite. More than once the difficulty has been said to have been solved by some enterprising inventor, but it must be admitted by practical men that a thoroughly satisfactory method of mounting the diamond point has yet to be discovered. If we reckon the hardness of the diamond at 10, the quartz which so largely enters into the composition of granite is 7; feldspar, 6; and mica only 3. But it is not alone the hardness of the component parts of a given material which must be taken into account in the operation of drilling. Texture counts for a great deal. It is found that coarse grained rocks can be more readily drilled than fine grained. The mineral which composes a stone may be very hard and yet the cementing material may hold the grains so closely that the drill will make rapid progress through the rock. In sawing, on the other hand, the problem is altogether different. The rate of sawing is fixed by the hardest mineral along a given cut. This must be divided and cannot be torn out from the cementing matrix as in the operation of drilling. Much of the difficulty in the use of diamond cutting points has arisen, because this great difference between the operation of drilling a rock and of sawing it has not been fully grasped.—*Stone Trades Journal.*

The Albert Hall, London.—The Albert Hall was originally designed by Captain Fowke, who, dying, was succeeded by Major-General H. Y. D. Scott, C.B., as architect. The latter considerably altered the original scheme of the former. The roof was designed by Mr. R. M. Ordish. The frieze, of monochrome inlay representing the Triumphs of Art and Science, was designed by the Academicians, H. W. Pickersgill, Armitage, Marks and Poynter. The work done by each of the above artists will be found fully explained in a paper read before the R. I. B. A. by Major-General Scott on Monday, January 22, 1872, and printed in the *"Transactions"* of the Institute. The building is an ellipse on plan, the total length being 266 feet from outer wall to outer wall, and the total breadth 232 feet. Drawings or descriptions giving details of the dimensions required do not appear to have been published. The building was completed in May, 1871.—*H. Y. M. in Builders' Journal.*

Sinking of the Amsterdam Bourse.—The foundations of the Bourse Building at Amsterdam, some illustrations of which may be found in our issue for February 17 last, have given way and the building is threatened with ruin and has been closed. It cost $4,000,000 and was completed but recently.

A Sisterly Competition in Churches.—At Willingsdale Doe, Essex, England, two churches stand in one churchyard. This unique position was brought about many years ago by a quarrel between two sisters, each of whom presented the parish with a church.—*Exchange.*

Aluminium Books.—A new use has been found for aluminium in the making of books for the blind—books which are read by passing the fingers over the embossed letters printed upon the pages. It is said that these books are much easier to read than the best paper books, especially by those who have become blind late in life and whose fingers are not very sensitive.—*From Chambers's Journal.*

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THE manner in which the École des Beaux-Arts is to utilize the endowment of five hundred thousand francs provided a year or so since by Mr. James Stillman, of New York, is interesting and discloses a liberality of understanding quite equal to that of the founder. The authorities are to use a portion of the annual income in maintaining twelve *bourses de voyage* or traveling-scholarships, each of the value of twelve hundred francs. Traveling-scholarships yielding only two hundred and fifty dollars each may seem very beggarly, but in reality they have a parity with the seemingly more liberal American scholarships, since they can be availed of only during the long vacation—the ten weeks that end in the early autumn—so that the beneficiary has at command practically the same monthly income that American students are so eager to win, one hundred dollars per month, namely. Actually the French students—for, of course, the Stillman prizes are open only to Frenchmen—are comparatively the better off, since they "know the ropes" and can travel more economically and, so, farther than can Americans unfamiliar with European ways and, moreover, hall-marked as money-burdened and extravagant Americans. It is not stated what income the Stillman fund yields, but avowedly only a portion of it is needed for the twelve "traveling purses." A portion of the balance is to be used in providing "one or several" supplementary prizes, which are to be awarded by the Conseil Supérieur de l'École to those of the twelve traveling-scholars who exhibit the best work done during the tour, and clearly these supplementary prizes may be of very considerable value, a fact which will, at once, make French students anxious to win a "bourse Stillman" and will serve to maintain its reputation at a high level. Any French student less than thirty years of age and not a winner of the Prix de Rome itself can apply for a Stillman purse, the assignments being regulated by the school standing of the applicant, a fact which, also, will lend dignity to the foundation. Finally, a student can only once be a beneficiary of the foundation.

IT may be remembered that at the time Mr. Seth Low became the reform mayor of New York, the firm of Horgan & Slattery had acquired a wide notoriety as the architects to whom Tammany Hall assigned all the "plums" in the municipal-building line. One of Mr. Low's first acts was to have the city's dealings with these architects inquired into, to the end that their onerous duties might be lightened to the extremest limit, and all contracts with them which offered a shadow of excuse were ordered canceled. Amongst other works the architects were preparing to carry out was the armory for the Sixty-ninth Regiment—the chief Irish organization, and therefore especially favored by Tammany— and when they found that this job was to be taken from them and transferred to the Hunt Brothers, because they repeatedly failed to amend their drawings and specifications so that the structure could be built within the appropriation, they naturally brought suit against the city and were awarded by the Supreme Court nearly twelve thousand dollars, with an additional five thousand dollars by way of damages. This settlement did not satisfy the city officials, and the case was carried before the Appellate Division, who last week handed down a decision unfavorable to the architects and denied their motion for a new trial.

TWO other cases to which we have given some attention have had further consideration by the court. Signor Biondi, the sculptor of the "Saturnalia," was last week told by the Appellate Division that he never had had a contract with the Trustees of the Metropolitan Museum of Art, and that these Trustees will discharge all the obligations to him which actual conditions impose by their placing the group, any time within a year, on some steamship plying to Italy and paying freight charges on the consignment. The other case is one of those curious instances of judicial maneuvering, which seem to have a likeness to simple thimble-rigging, that do so much to bring the courts of New York into disrepute. When, a few weeks ago, the Appellate Division confirmed the judgment of the lower court and so informed Mr. Howard Gould that he must pay to Mr. A. J. Haydel twenty-five thousand dollars for professional services in designing "Castle Gould," it also expressly denied to Mr. Gould the privilege of carrying his case before the Court of Appeals—for it is the prime function of the Appellate Division to prevent the docket of the higher court being cumbered with foolish appeals. Nevertheless, Mr. Gould's diligent lawyers have been able to find one justice of the higher court who has declared his willingness to hear the case—for the sake, perhaps, of being possibly able to flout the lower court. Mr. Haydel, therefore, is not yet at the end of his troubles, may finally lose the case on this appeal, and have finally to pay the legal costs of three trials without receiving any aid at all from Mr. Gould's bank account.

Entered at the Post-Office at New York as second-class matter.

IN the noted case of Mrs. Schuyler, and in a later case decided by Chief Justice Parker, of the New York courts—later candidate for the Presidency—a case which brought out from the non-suited victim, a young lady who herself had studied law to some purpose, one of the shrewdest pieces of forensic argument (in admirable English) we ever had the pleasure of reading—it was decided that, in New York at least, a person has no right of private property in his or her own countenance and figure. Possibly the law may be different in Pennsylvania, and ex-Governor Stone may be able to secure the elision of his portrait, in high relief, from the new bronze doors of the Capitol at Harrisburg; if not, he stands pledged to file it off himself. The history of that particular building, notorious from its inception, could do useful work if written up in detail and placed in the hands of those foolish persons who pretend to believe that the government, municipal, state or national, should do all things, and private enterprise undertake nothing. After a short, but hardly unsullied career, this new state-house is barely more than ready for occupancy, and yet it is already discovered that it is too small for its intended uses, and the architect is said to be making drawings for a new wing, which the manipulators expect to be able to attach to the present building in some fortuitous, if not entirely architectural, fashion.

THE Housesmiths' Union added to its unenviable reputation last week by killing one and seriously injuring two other special policemen high up on the framework of the new Plaza Hotel in New York, and though there were plenty of witnesses, the assailants were allowed to escape at their leisure. About the most sinister feature of the crime is the fact that all the members of the union employed on the work, some forty men, whether they had or had not joined in the assault, left the building as soon as the job was done, and have not attempted to report for work again, their places having to be filled later by new men. If the law, on such evidence of complicity, cannot lay hands on each of these men as an accessory before or after the fact, why then, so much the worse for the ordinary citizen's respect for the law. The incident, successor to a long series of brutal and unpunished crimes, tempts one to believe that the community stands in need of the relief that only a vigilance committee can afford.

IF the reception-committee in charge of the International Congress of Architects, now holding in London, are in the habit of reading New York papers, where they come upon frequent strictures on the western fancy for wearing the "dress-suit" at untimely hours, we must suppose that the kindly but rather unusual bit of information included in the official programme is intended largely for American consumption. "The attention of foreign members," says this arbiter of good taste, "is called to the fact that evening dress is never worn during the daytime in England, but always at an evening function. On ceremonious occasions such as the inaugural meeting at Guildhall a frock coat should be worn"! American travelers will do well to remember that on the Continent evening dress is worn on "ceremonious occasions," even by daylight.

SECRETARY METCALF, of the Department of Commerce and Labor, has just made a decision which able lawyers may later shape up into a very effective branch in the alien labor contract laws. The case was that of the proposed deportation of three machinists who had been imported from St. John, N. B., to operate certain nail-making machines in an Illinois town, machines whose value depends largely on the manual dexterity of the operators. Secretary Metcalf rules that the men need not be deported, for the reason that the Illinois man already has his machines set up and they cannot be operated since there are no machinists in the country who have had the five years' practice in operating them that the St. John machinists have had. Of course there are American machinists who can run the machines somehow, at a loss, that is, but it is not fair to impose that loss simply for the sake of keeping the law unbroken. The ruling is kindly and sensible, but it seems distinctly capable of extension by analogous reasoning to a great number of other skilled laborers who ordinarily are not now allowed to enter this country under contract.

WE do not know whether amongst the bills favorably acted upon in the hurry of the closing days of the late session of Congress was Senator Patterson's bill providing for the preservation of our "national monuments." The desirability of such a measure is emphasized by an incident that occurred since then in Hillsboro, Washington County, Pa., where a farmer, the owner of the land whereon it stood, irritated because his crops were injured by crowds of more or less archæologically-minded excursionists, destroyed with dynamite an Indian altar-stone which was unique amongst the sculptured relics of departed aboriginals because of the presence amongst its hieroglyphs of a kangaroo, a creature not recognized as belonging to the fauna of this hemisphere. The act of the irritated bucolic is understandable, though to be regretted; but it may be of real service in determining the passage of an effective law that may protect the curious, if not valuable, relics of earlier races. At the same time it would not be proper to cry out on this as a peculiarly atrocious act of "vandalism," in view of the apathy that has allowed that other great "national monument"—with apologies to the Canadian people—Niagara Falls, to be brought within the shadow of grievous injury and possible annihilation.

THE rumors now coming with frequency over the wires from San Francisco, alleging that there is shameful mismanagement of the vast relief-fund, particularly by the Red Cross organization which President Roosevelt was so strenuous to have manage the whole situation, are particularly disquieting. About the only encouraging rumor that attaches to this vast sum is one that declares that the Rehabilitation Committee has about perfected plans for using some three million dollars in building homes for the unhoused. Even if this sum should have to be spent in building mere combustible shanties and barracks without an atom of architectural merit about them, it would be a wiser use of the people's alms than to have it frittered away in paying salaries for the winding and unwinding of red tape.

COLOR IN STONEWORK.—III.

THE GREENS.

GREEN is a color equally as effective as red for decorative stonework. While the choice offered is not nearly as extensive as in the reds, still there are varieties covering almost every gradation of tint. First there are the two serpentines of which mention has already been made. That from Hoboken has no uniformity, is light and dark, and sometimes almost approaches a yellow. The serpentine from Chester County, Pa., has not a glassy structure, like most of its fellows, but has more the texture of a sandstone. It is of a grass or moss green color. Quarries have been opened for a great many years, and the stone has been used for the entire superstructures of public buildings, such as court-houses, schools and churches, and always with effect. There is a serpentine found at Westfield, Mass., in various shades of green. One kind is spangled with black, giving a most unusual and attractive appearance. There is a large deposit of serpentine and tremolite at Easton, Pa., running across the Delaware River into New Jersey. Every tint of green can be had in the serpentine, although most of it is of light grass-green shade. It is usually traversed with bands of asbestos, not so fibrous but that they will retain a polish. A combination of the green serpentine with rose dolomite, before this discovery in mass known only in scattered cabinet-specimens, has been given the trade name of "Verdolite." The tremolite runs to the lighter greens, some varieties being almost white. This is a hard, dense stone. Serpentine marbles have been quarried for years in Maryland—in Cecil, Harford, Baltimore, Howard, and Montgomery Counties. This is dark and very lustrous. In the State of Washington, mainly in Stevens County, have been found serpentines in most bewildering variety. Some are striped and banded, while others have fern-like markings, similar to moss-agate. The color ranges from light to very dark, oftentimes with other colors introduced in mottlings. One disadvantage of the stone is its softness. Some pieces can be scratched with the finger-nail. It cannot, therefore, be very durable, and it retains a polish for a short time only.

At Holly Springs, Ga., and at Swanton, Vt., are hard, dense, verde-antique marbles. From the latter place are also obtained green marbles of much lighter tint. The cipollino of Eakles Mill, Md., has been spoken of, and from the same place are obtained other veined and mottled green marbles. In these the ground-mass is of cream-color, and the markings in the darker color. Warrensburg, N. Y., has a marble of a greenish-gray, with patches and nodules of bright green, the latter being very similar to the famous Royal Irish Connemara marble. Near Leesburg, Va., are fine light and dark green marbles, marked with white. A wonderful array of green marbles can be had from San Diego County, California: perhaps the prevailing tint is apple-green, but the stone ranges from this up to a greenish-white, and down to a deep moss-green.

Few granites would be called green, although the color frequently occurs in the markings, as in the stone from Pompton, N. J. There is a genuine green, however, at German Valley, N. J., and the deep green granite from Windsor, Vt., has won many admirers for its rich sheen. It takes a polish remarkably even and glassy.

THE BLUES.

As a term applied to stone, blue is almost a courtesy title. Most of the so-called blues are nothing but varying tints of gray. It could not be otherwise, as the color is generally formed by the combination of black and white mineral ingredients. The blue granites have scarcely a trace of the shade that gives them their name, and everyone is familiar with that variety of silicious and argillaceous sandstone that has always been known to the trade as "bluestone." There are many "blue" limestones, but none of these furnishes a color that would be useful in decoration. Among the blue marbles, the famous Vermont marbles are what might more properly be called dove-color. They are not of a permanent tint, if exposed to the weather. At Gouverneur, St. Lawrence County, New York, is quarried a marble of several shades of blue. The Pennslyvania "unfading blue" is from King-of-Prussia, Montgomery County, and ranges from light to dark, often mottled and striped. The only genuine sky-blue marble within the knowledge of the writer is found in the vicinity of Riverside, Cal. The deposit is not sound, and most of the stone has been burned into lime. With proper care, slabs of fair size should be obtained, and the color is so desirable that it would pay to "back up" sawed pieces for decorative work.

THE YELLOWS AND BUFFS.

Yellow is another term that is loosely applied to stone. Most of the rock that is so designated should more properly be characterized as buff. A limestone quarried at Frontenac, Minn., is distinctly yellow when first taken from its bed, but on exposure it weathers to a decided gray. This stone was chosen for the interior work of St. John the Divine, in New York, but as much of this has been set in the open air, owing to the absence of the roof, it has already undergone the transformation in tint. A more permanent yellow is a sandstone that is found in North Carolina, in the vicinity of Wadesboro. This might be called canary-color, without too great a stretch of the imagination. The texture is very fine, and the stone works and tools like Caen stone. The deposit has not been extensively developed as yet, and it is listed because nothing similar is known. A bright yellow marble occurs near Canton, St. Lawrence County, N. Y., and one of a similar tint, but much harder, in Inyo County, Cal. The latter occasionally has delicate fernlike markings. The Le Grand "Iowa marble" is a light yellowish-buff magnesian limestone.

A unique stone in its class is the Mohegan granite, quarried some distance back from Peekskill. It is of this stone that the exterior walls of the Cathedral of St. John the Divine are being built. It is a pronounced brownish-yellow, the color being due to the alteration of the mica ingredients.

The buff stones are too numerous to mention in detail. The most famous are the Ohio sandstones from North Amherst, Chagrin Falls, Independence, Otway, Portsmouth, and other places, and the Indiana limestones from the Bedford region. Carthage, Mo., and Batesville, Ark., have cream-colored magnesian limestones, and a light, almost white oolite is quarried at Litchfield and Princeton, Ky.

THE WHITES, GRAYS AND BLACKS.

Of the whites and the grays it is needless to say much. These colors, whether in marble or granite, are so widely known that little would be gained in merely cataloguing the places of production. Distinction should be made, however, between the carbonate of lime white marbles of Vermont, South Egremont, Mass., and Georgia, and the dolomites from Ashley Falls and Lee, Mass.; Canaan, Conn.; Gouverneur, South Dover, Pleasantville, and Tuckahoe, N. Y.; Cockeysville and Eakles Mill, Md., and the recently introduced Alamaba marble, from Talladega County. The carbonate-of-lime marbles have a tendency to weather to an old-ivory tint, while the dolomites generally weather gray. There is also a sharp distinction between the texture of the various white marbles, some of them being very coarsely crystalline, like the Pleasantville and Georgia marbles, and others very fine-grained, like the Vermont and Eakles Mill stones. The Chester Goodale, from South Egremont, Mass., and the Gouverneur marbles represent the medium textures.

The granites are found in every shade of gray. There is the granite from Bethel, Vt., that almost approaches marble in whiteness, and from this the tints grade down until one reaches the very dark gray-green of Quincy. Many of the gray granites have a pink flush, owing to the color of the feldspar crystals. The texture is as various as the tinting, every degree of fineness being represented, from saccharoidal to coarsely-porphyritic formation.

Of late years the demand for black stone has been so slight that many of the large quarries have been abandoned. It is sufficient, therefore, to mention the lustrous black granite of Addison, Me., and the brilliant plain, mottled, and veined black marbles of Glens Falls, N. Y., Dalton, Ga., and Fort Bowie, Ariz.

The foregoing classification of the stones of America, the first of its kind ever undertaken, is proof that the architect can have at his command many of the most beautiful tints in a permanent and durable form, if he seeks to call in the colors of the painter to aid him in his work. Whether he wishes to use subdued tints in large masses, or bright colors to help out decorative details, he can be accommodated by the output of our quarries. In almost every case, the stones mentioned above are commercially produced at present. In a very few instances, quarries were formerly operated, but

have been shut down. However, there will generally be found some stone on the "bank," or easily and cheaply accessible from the ledges. Even if a deposit were entirely undeveloped, a few inquiries concerning the stone would soon bring it into the market. FRANCIS W. HOYT.

THE REBIRTH OF RIO DE JANEIRO.

THE city of Rio de Janeiro was a very badly built town. The greater part of its streets, narrow and lined with ill-lighted and little ventilated houses, lay but little above the level of the sea. A few feet below the surface was to be found a sheet of ground water that had filtered down from the mountains which surround the city or coming from the ancient marshes which filled the valleys between the mountains, areas carelessly filled in and poorly drained.

To have an idea of the topography of the town the reader has but to place his hand on the table, palm downwards and with fingers outspread; the fingers represent the mountain chains, very lofty, some, like Corcovado, rising out of a plain to a height of more than 700 metres. The spaces between the fingers are the inhabited valleys; the back of the hand stands for the Carioca chain which unites the secondary ranges while the line which in a sinuous manner unites the finger-tips represents the shore line of the bay.

Several, even many, studies have been made for the sanitation of the city, but nothing stood the test of time. The problem was so complex that to undertake to deal with it with the desirable thoroughness required more money than the Brazilian Government could provide; for it would have been necessary to remove all the inhabitants, destroy all the buildings and rebuild them.

In the opinion of many experts, myself the least important among the number, it was held that, though it was necessary to adopt radical measures, they need not be so all-embracing as others advised. Among these latter there were some who said that there ought to be undertaken the absolute drying of the sub-soil of Rio—a veritable tun of the Danaides, because of the filtration from the mountains and the pressure from the tides. At the last congress of engineers at Rio, I had a chance to urge the adoption of less radical, yet sufficiently important, measures—the piercing of certain arteries which should feel the influence of the breeze that begins to blow with the rising tide and which makes itself very perceptible at the height of a few metres above the plain where Rio sits; next the demolition of certain quarters, the paving in an impermeable and systematic manner of all inhabited parts of the city, and the planting of trees elsewhere. Others shared my opinion, among them His Excellency the present President of the United States of Brazil, Senhor Rodrigues-Alves.

As soon as he was installed in office he called in to undertake the work the most capable men he could find: Sr. L. Müller, Minister of Public Works; Sr. Pereira-Passos, Prefect of Rio; Sr. Paolo Frontin, Chief Engineer of the Central Avenue work; Srs. Sonto and Bicalho, chief-engineers of the works for the new quais and harbor; Sr. Lara, chief-engineer of the

THE NEW CENTRAL AVENUE, RIO DE JANEIRO, BRAZIL: LOOKING TOWARD SUGARLOAF MOUNTAIN.

reconstruction of the Mangue Canal, which traverses the city, and Sr. Seabra, Minister for the Interior, who appointed as his aid Dr. Oswald Couz, who believed in the American theory, that the mosquito, stegomia-fasciata, was the propagator of the yellow fever which every summer scourged the city, driving people from it as from an infected and perilous spot, affecting seriously the good credit of Brazil and putting a check on immigration.

The labor of all these men has been thorough and the entire plan of sanitation will have been carried out during the four years' term of office of Sr. Rodrigues-Alves. Some of the work, in this country which has never shown much faith in its own power, has been carried out with a good deal of Yankee energy—as for example the Central Avenue works, where, thanks to the talent and activity of Sr. Frontin and despite of the unbelievers, in less than two years the entire quarter has been demolished and rebuilt.

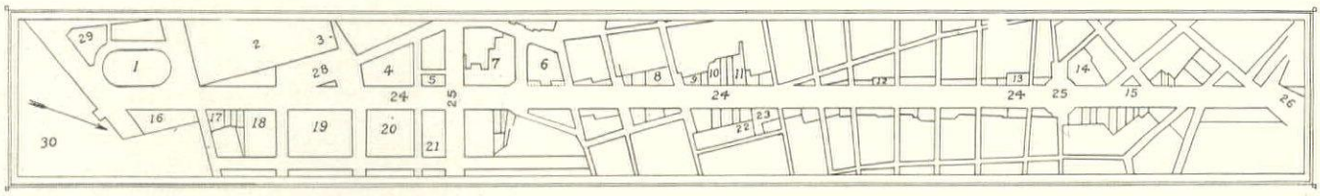
To comprehend what Sr. Frontin had to overcome, one would have to know not only the number and character of the old

rookeries that had to be emptied of their inhabitants and demolished, but understand also the routine-bound and inert character of the owners of the buildings. In spite of this, thanks to the patience and tact of Sr. Frontin, all these expropriations were effected without giving rise to a single suit at law!

Once the buildings were empty the work of demolition proceeded speedily. Those who had declared that expropriation never could be effected because the resulting lawsuits would be interminable now declared that demolition would last till Doomsday. And when they saw the ground cleared, as if by enchantment, they asserted that no purchasers for the cleared sites would come forward. When these actually presented themselves, they argued that it would be impossible for them to find money with which to pay architect and builder. But since the Government had provided, under pain of successive penalties, that building in each case should be begun forthwith and finished within a certain stated time, it was able to bar any speculation in land. So the Central Avenue, already paved and with sidewalks laid, with electric-light standards planted and trees set out, all in fact finished, so far as the Government's share of the work is concerned, is now in train of being architecturally finished by the new owners of lots abutting on it, and all the public buildings that are to adorn its length are now well advanced toward completion. In other words, by November 15 next, the date when the present Government's term of office expires, the Central Avenue will be really finished. The annexed plan and other illustrations show the size and character of this great "improvement."

The Central Avenue runs nearly north and south and so allows the refreshing breezes from the ocean to pour directly through a district which was formerly encumbered with ruinous buildings, untidy and pestiferous.

THE NEW CENTRAL AVENUE.



1. Brazilian Building from the Louisiana Purchase Exposition.
2. Old Convent of Our Lady of Aid.
3. Municipal Building.
4. New Theater.
5. Navy Club.
6. Tramway Company Offices.
7. School of Arts and Crafts.
8. "The Paiz" Newspaper Office.
9. Engineers' Club.
11. "Journal of Brazil" Offices.
14. Bank of Redemption.
16. Proposed Grand Hotel.
17. Army Club.
18. Cardinal's Palace.
19. National Library.
20. School of Fine Arts.
21. Tuberculosis Building.
22. Equitable of Brazil.
23. "Journal of Commerce" Office.
24. Central Avenue.
25. Dr. Frontin Square.
26. New Docks.
28. Proposed Monument to Marshal Floriano.
29. Gardens.
30. Port of Rio de Janeiro.

Some blame him for allowing the erection of buildings with no pretence to beauty, and on this head much might be said, for, except upon the Central Avenue, the architectural fate of the city has been left in the hands of builders without taste or training.

Finally, we owe to the Prefect a fine avenue, "Au bord du Mer," where formerly there were only wharves and foul-smelling shores. To-day we find in their place gardens stretching along for miles and facing the most beautiful panorama the world provides—the Bay of Rio de Janeiro. We also owe to him Atlantic Avenue, out beyond the Bay, along the ocean front, making in reality a continuation of the avenue first named. It is here there will grow up a bathing-resort. We owe him the gardens which everywhere replace neglected and unkempt spaces. We shall owe to him a new city, and this should go far to offset the complaints as to his arbitrary methods.

As to the work upon the new harbor and quais being carried out by Messrs. Walker & Co., under the direction of Senhores Vieira and Bicalho, already, by the use of compressed-air caissons, a considerable progress has been made on the foundations of the quais which are to extend for seven kilometres, while the sea-wall and its filling is complete for more than 500 metres. Hereafter passengers will not be forced to tranship to small steamers in order to reach the shore; they will land directly on the new quais and already we see in our streets many of the "globe-trotters" who a short time ago would have avoided Rio as if a pest-house.

The sanitary reformation of the Canal Mangue goes on more

VIEWS ALONG THE NEW CENTRAL AVENUE, RIO DE JANEIRO.

On his part the Prefect, endowed with far wider powers than those Sr. Frontin could exercise, attacked the city on all sides, opening new streets, widening others, raising the grade of almost all, repaving with asphalt, and demolishing all the old hovels and structures where the hygienic conditions were bad. But in place of securing as good results as Sr. Frontin, Senhor Pessos, —perhaps because of a certain rough-handedness, which doubtless was excusable in many cases—aroused a hostility which might easily have been avoided. Nevertheless he let air in from all sides, demolished everything that stood in the way of sanitation, carried wide streets through where, before, vehicles could slowly; but, once finished, this will be one of the beauties of the city, with its quadruple avenues lined with royal palm-trees rising to a height of thirty metres and over and stretching along for several kilometres.

All these undertakings are covered by the sanitary precautions provided by Dr. O. Cruz, who has organized a veritable army of disinfectors, and he has known so well how to avail of his means and methods that during the month of March of this year—the month when the deaths from yellow fever used to be counted by hundreds—*there was only a single case of yellow fever in the entire city!*

The sanitary renaissance of Rio is in a good way and there is every reason for believing that the new President of the Republic will continue the patriotic undertaking.

Justice requires that, in all this work, very great credit should be accorded to Sr. L. Müller, the Minister of Public Works, who has known how to carry out, with a rare courage, all the work belonging to his portfolio—from the railroads to the harbor, from the mines to the urban improvements. It is he who has dealt with the important work at the bar and at the harbor of Rio-Grande-do-Sul, carried out by the American engineer Corthell; it is he who, after long negotiations, has arranged for electric service by a contract with an American concern, the Rio Light and Power Co.; it is he, again, who called in the American geologist, Mr. White, who has made such a favorable report on the coal-mines of Brazil, and it is he who has just reorganized the "Lloyd Brésilien."

It is to be hoped that all these accomplishments will be of real profit to the progress of Brazil.

A. Morales de los Rios.
Architect and Engineer.

SAN FRANCISCO VISITED.

THE story of San Francisco's appalling disaster has been told and retold most graphically in the daily press and periodicals; though no man who has not visited and spent many days in the stricken city can fully appreciate the extent, the thoroughness of the destruction and the disorganization of everything affected by that disaster.

San Francisco was subject to earthquake shocks, very subject to them, and had every reason to expect one, or many, of far greater severity than the average. These little trembles had for effect that brickwork set in poor mortar and improperly tied and bonded, little four-inch chimneys and veneering and such, was frequently thrown down so that people got into the notion that wood was the only quake-proof material to use in building. And so they used it until the city became a veritable lumber-yard, and a new danger was introduced, the fire-hazard. Finally, the building-laws, always and now a hodge-podge, compelled people within a very limited district to use brick or stone enclosing walls, though the framing, the internals of far too high buildings, could still be of wood. The insurance companies, innocently or foolishly, aided and abetted the growth of this fire-hazard by writing insurance at an exceedingly low rate because of the city's especially fine fire-department!

Much less than twenty years ago the first very tall building was built, using a steel frame. People generally, even the building authorities, tried to discourage this mode of construction because of its great danger in case of earthquake; they expected the tall steel frame to topple over at the first shake. There was so much fuss made that, as a result, the architects and engineers have done really very fine work in these steel frames; they are braced and trussed and tied so that, though there was vibration and some action in the great earthquake, not one of them was materially affected, and what people had deemed the greatest risk was virtually the only thing that went through the experience more or less intact. In those big buildings, however, the foundation and the steel framing were generally the only things in which extra precautions were taken. The stonework, the brickwork, the fireproofing, everything else about them, were no better done or more firmly tied (in fact not nearly so well as) than is common in the East where earthquake is a very remote contingency. Nor were any extra precautions taken in those big buildings, with one or two exceptions, to prevent the spread of fire in their contents, their finish, floors, etc., to the complete destruction of everything damageable by fire and even great injury to really fireproof details. They were "fireproof," those buildings, only in that the steelwork was more or less protected by tile or concrete and the floors themselves and the partitions were either tile, concrete or some patent plaster. That one detail constituted a fireproof building and was expected by some mysterious or occult agencies to impart immunity to however burnable materials that were used in the rest of the structure. And none of that fireproofing even, was done in accordance with our very best Eastern standards of construction.

Such was the city and its state of unpreparedness when earthquake, fire, and dynamite in unskilled hands, attacked it. The surprising fact is not that the fire was so great, but that it was as lenient with the big buildings as it proved to be. It was an all-searching fire, though it did not at any time develop as high temperatures as the Baltimore fire that was accompanied with a hurricane wind. To this absence of high temperatures is largely due the fact that there was in the big buildings as little damage effected as we have to note. Then, too, as in Baltimore, the fire was freaky. It would lap around and linger about one corner of a building and perhaps lightly pass over the others where as great damage could have been effected; indeed, what little breeze there was accompanying the fire and the currents created by it were so erratic that here and there even a wooden building is but partially consumed or perhaps but little affected, while telegraph poles still stand and occasionally a wood or cloth sign still remains intact, while all else about it is utterly destroyed or damaged beyond salvation.

The steel frame and foundation work were well done in the big building, but as high eulogium cannot be given to any other detail. The curtain-walls, supported from story to story, were hardly ever properly and completely bonded and seldom at all adequately tied to the steel frame; the result was that the earthquake cracked many of these walls and shook some out of place; granite and stone and marble were used externally all too frequently, and wherever fire struck them, spalling and irreparable damage ensued. Brickwork was seldom damaged so far as the brick was concerned, but lack of bond and tying and the use of lime mortar demonstrated that the best practice had not been followed in its use, though the damage to the brickwork of the tall buildings was remarkably slight, all things considered; terra-cotta, where well made, of equal thickness throughout all exposed parts, and with a sufficiency of web and stoutly tied in place, showed itself vastly superior to all else for external decorative features. Where earthquakes are so frequent, it is folly to lay a two-inch tile protection around an important steel column, merely clipping with galvanized iron at the corners and making these tiles part and parcel of the partition and set up often in lime mortar. The partitions were in many cases of but three-inch tile set either on top of the wooden floor or on top of the concrete filling and wood strips, and were bisected in every direction with wooden lintels, wooden jambs, sills, etc., so that it is really a wonder that anything was left of them; the floors were generally of side-construction, particularly thin tile and of little depth, and all this tile work was of dense tile, the quality of the material, the mode of burning it, the pattern and way of applying it not at all up to the standard of our best Eastern work. Yet this was all the architects demanded, it was what the market seemed to exact, and all that the manufacturers produced. Their competitors, the two concrete systems most in vogue in San Francisco, were held up to about the same standard only, so that in most cases columns were fireproofed with a wrapping of expanded-metal or wire-lath plastered over with a little cement or, in a majority of cases, ordinary wall finish; partitions were generally of wire-lath and plaster, the floors of as thin slabs and as weak a concrete as would pass muster, though as luck would have it most of these floors were in turn protected with a suspended metal-and-plaster ceiling. As for other than the mere fireproofing of the structural parts, not one of those buildings was fireproof in design, save in one or two of the details. Not one of the tall ones had its elevator shaft and stairs enclosed so as to confine fire to any one story; only one had metallic doors and trim; all had wooden floors in their offices; not one had wired-glass or other protection to all its windows; hence fire was communicated to the interiors of buildings through windows in ninety-nine cases out of one hundred.

One building there was in which, though of wooden frame and finish enclosed in brick walls, they had been wise enough to install wired-glass and metal sash at all the windows; and the efficacy of the wired glass is proved by the fact that the day after the fire men were at work at their usual places on what they had left the day before. Yet in another building nearby, of exactly the same "slow-burning" construction, but unprotected with wired-glass windows, the destruction was absolutely complete and just forty minutes slow.

No one building was absolutely perfect, nor was any one building absolutely saved from damage (albeit the new *Chronicle* and the Kohl suffered certainly less than 5 per cent. of their cost), yet so many details, found separately, did their work so well that it must be perfectly patent to the most obtuse that if those details were assembled in any one structure that structure must necessarily be fireproof and undamageable in *all* its parts.

My ideal of a perfect building, a fireproof building in the fullest sense of the term, is one whose foundations are sound, and if in yielding ground, supported to bottom on reinforced-concrete piles; my foundation piers and walls would be of concrete, externally lined with strenolith against moisture; my steel frame would be rigidly braced and tied and, whether painted or not, well coated with cement and encased, in every void, with brick or tile or con-

crete and the whole protected with hollow-tile fireproofing, laid in cement mortar, bonded and tied to the columns and with not less than two inches of material between any possible fire and the metal members; my structural floors would be of narrow span, deep end-construction fireproofing tile between steel beams, or if concrete is particularly desired then a sufficient depth of that material protected on the under side with fireproofing tile, the top surface of marble or cement or some plastic body, but not wood. My partitions would be of hollow tile; my outer walls would be of concrete or brick, faced on both sides with brick, well laid and bonded; my external decorations would be of terra-cotta of ample thickness and properly made, no granite or stone-work or marble would I have where fire could assail it; my stairs and elevators would be enclosed, absolutely cutting off every story by itself, and my units of floor-space would be as small as possible, so as to restrict fire to the contents in a much curtailed area; my window and door trim and doors and finish and my office furniture would be of metal, nor would there be any wood lintels or door jambs in the partitions; my windows would be glazed with wired glass in metal or asbestos frames, and there where the exposure is great I would have doubled thickness of wired glass; and last but not least, in assembling these parts I would endeavor to use *intelligence* in design.

Each one of those details, even the last, has been fully tested and found not wanting in the San Francisco and other fires. The thing is to get them all together and then the resultant building will be one that indeed merits the term "absolutely fireproof."

F. W. Fitzpatrick.

ALMA-TADEMA, ROYAL GOLD MEDALIST.

THE Royal Gold Medal for the promotion of architecture was on June 25 conferred upon Sir Lawrence Alma Tadema. It was the second occasion when a painter was the recipient, and by a remarkable coincidence both were painters of ancient Greek and Roman life. Both might also be considered as mural painters in the modern sense of the phrase. Lord Leighton painted directly on the walls of a church in the Isle of Wight and in the museum at South Kensington. He also was prepared to take a part in the decoration of St. Paul's. Sir L. Alma-Tadema assisted in the mural works at the Antwerp Town-hall. But that was nearly fifty years ago. The prices paid for his works in England, and which did not exceed their value, were at a rate that would make mural works on a large scale almost beyond the resources of millionaires. It is, therefore, as a painter of easel pictures and as a creator of cabinet paintings, rather than as a decorator, that the artist must be considered. In one sense his nomination would seem to open the door to a great many candidates. For, indeed, it would now be difficult to decide what painter was not eligible for the distinction.

If, however, we remember that one of the conditions for a gold medalist is the production of "a work tending to promote or facilitate the knowledge of architecture," then there is hardly another artist among English painters who is on an equality with him. He has certainly never attempted to recreate an entire building and to make it the subject of one of his pictures. His "Phidias at the Parthenon" was suggestive of a great temple in process of construction, and parts of buildings have been introduced with remarkable skill in the majority of his paintings. But Sir L. Alma-Tadema was always more than a painter of costumes, of buildings or of ancient objects. M. Chesneau described the artist's work as an accurate illustration of Smith's "*Dictionary of Antiquities.*" That book is a credit to English scholarship and to George Scharff and other draughtsmen. But it is almost as widely differentiated from Sir Alma-Tadema's work as from Greek and Roman life. The woodcuts are diagrams, and a great many of the defects of English classical and historical paintings have been owing to the belief that such things could be without difficulty translated into pictures. Anyone who will read the suggestions given by Sir Walter Scott to a painter who had selected "Chevy Chase" for a subject will find that much more than any dictionary of antiquities is desirable for the creation of an historic scene. Scott realized that the typical examples which have to be adopted in treatises on armor, costume or other branches of archæology were not likely to prevail at any time. It would be as absurd to suppose that all ladies at the present day walked about the streets in the dresses shown in the fashion-plates as to assume that the scenes in Athens or Rome, or in Greek or Roman houses, corresponded with what is found in dictionaries of antiquities. Costume always acquired a character corresponding with individualities. Scott pointed out the ancient description of a marauder who had trews of buckskin "wi' a' the hair aboon." But he took care to warn the artist that such a costume, although warranted by evidence, should only be used for one wild figure in the picture of "Chevy Chase."

Scott had the power of self-projection, and was able to live, as it were, in any period or country, or among any race he had made the object of his studies. Purists in archæology have declared that his descriptions are misleading. But in compensation we have beings in whose existence we are compelled to believe. The French hold that Corneille's Romans are far superior to Shakespeare's. But, as Dr. Johnson has said truly, the English dramatist's Romans are men—which is more than can be said of the Frenchman's. Sir L. Alma-Tadema has, no doubt, studied Smith's "*Dictionary.*" But he has studied much else besides; and he possesses the skill to impart to inanimate objects an importance far beyond that given to them by the keepers of museums or the vast majority of visitors to collections. Sir Lawrence is a Dutchman. But in his ways he is a thorough Englishman. He has the faculty of being easily acclimatized and, if he cared, he could present a convincing picture of an English scene of, say, the eighteenth century. He could also paint an incident of our time with as much ease and accuracy as he paints the portrait of a living Englishman or English lady. That power is shown in his incidents from ancient history. Costumes, marbles and decorative objects will all repay examination as he depicts them. But what strikes the ordinary spectator is the conviction that the picture as a whole is a close approach to a representation of what at one time must have happened. Ruskin was, therefore, unwarranted, so far as the experience of ordinary people could go, when he said: "M. Tadema, after reading his Smith's '*Dictionary*' through from A to Z, knows nothing of Rome but her shadow, and that cast at sunset." If the study of all the remains of antiquity is not sufficient to enable a clever artist to depict an ancient scene, then the sooner men forget there was a past the better for themselves. All such efforts are, if Mr. Ruskin's theory is accepted, only waste of time, and artists had better occupy themselves with painting daisies and colored stones.

Painting undoubtedly can assist the historian, and it is possible that artists may yet exist who will be able to surpass the Roman scenes of Sir L. Alma-Tadema, as he has surpassed those of David and Benjamin West. But it is doubtful whether any of the future painters will be more devoted to a particular period. There are many admirers of Sir L. Alma-Tadema who express regret that he should have abandoned Merovingian scenes for those of Greece and Rome. The recitals of Augustin Thierry continue to be attractive, and we seem, as it were, when reading them, to see the beginning of that social formation in which we live. The remnants of barbarism which still exsited in those days are at least picturesque, and Sir Lawrence found no difficulty in making many pleasant pictures out of them. But he may be said to have forsaken such subjects when he arrived in England. Perhaps he supposed that the early history of the Franks would have little attraction for Anglo-Saxons.

Since 1869 England has had the benefit of seeing every year one or more masterpieces which bring back Greek or Roman life before the eyes of visitors to the Academy or Grafton Gallery. That the standard of excellence could be maintained for nearly forty years is remarkable. In producing such works a painter must have all his thoughts at a very high level. Classic subjects, whether taken from the Forum or the kitchen, are supposed to have something of the ideal about them, and it would be fatal to suggest, like John Leech in his illustrations to Roman history, that there was often a correspondence between antiquity and our time. Gérôme, who likewise could paint admirable Greek and Roman scenes, took care to diversify them with those of a later period. Richelieu and Napoleon made it more easy for him to paint Cæsar or gladiators. Sir L. Alma-Tadema has been strong enough to bear the strain, with only the occasional variation of a portrait of some friend.

In his paintings he has realized the importance of architecture, to the Roman grandees at least. We are ignorant about the domestic architecture of Greece; and Pompeii suggests how Romans, in order to escape from the life of the city, put up with as much inconvenience as Englishmen now endure in their so-called holidays. But we must believe that the men who, amidst the pride, pomp and circumstance of glorious war, set a high value on statues, were able to realize that a marble or bronze figure lost much of its importance if it had a mean background. We cannot suppose that Agrippa gave audience to clients amidst such simple surroundings as suited Cincinnatus or Camillus. The architecture which Sir L. Alma-Tadema employed must have

secured favor for English attempts to revive similar forms in buildings.

Simple humorists parade their cleverness by remarks on the marble which is so effectively introduced into the majority of his paintings. They do not realize that no other material is so well adapted for a background, apart altogether from the necessity of using marble as evidence of Roman luxury. Supposing the marble seats, with their great curves, were supplanted by tapestry, would the figures gain in importance? It might even be concluded that for the display of Greek and Roman costumes, and the delicate contrast which is a necessity, no more suitable material could be found than marble. In one of his tragic pictures, where the murder of one emperor is immediately followed by the discovery of another, massive drapery has to be introduced, and in quantity and color it exceeds the marble. There is no doubt it adds to the effect of such a scene. But if compared with one of the idylls or compositions in which young girls and children are introduced, we recognize at once how well the artist understands the relative merits of different materials in order to add importance to his living figures.

In his reply on Monday Sir L. Alma-Tadema spoke modestly about his own acquaintance with architecture. His own studio would by itself be enough to suggest that he does not seek models by confining himself to Smith's "*Dictionary of Antiquities.*" What is true of building with him is no less applicable to much else which appears in his paintings. Sir L. Alma-Tadema is not only a painter of a very high class, but he is an archæologist for whom the dry bones of the science are animated, and if not an architect he is an enthusiast for architecture of the noblest class.—*The Architect.*

COMMUNICATION

THE CHURCH OF CHRIST, SCIENTIST.

Office of the Publication Committee of the
First Church of Christ, Scientist,
Boston, Mass., July 10, 1906.

To the Editor of The American Architect.

Dear Sir—The appearance in your issue of June 16th of an inconsiderate editorial comment on Christian Science is a matter of surprise to your Christian Science readers, and they cannot but regret that your columns should have been thus misused to disparage a religion which holds before its followers the loftiest ideals and which has accomplished, without a shadow of doubt, an immense amount of healing and reformatory work, and which, for this reason, should be encouraged by all publications interested in the ethical, spiritual and physical well being of the race.

You may not be aware of it, but you should know that many of your readers are Christian Scientists, or are interested in it more or less. It is a discourtesy to them to publish such an article as this and they undoubtedly feel that such utterances are distinctly out of place in any newspaper, and especially are they inappropriate to the columns of a trade or technical paper. They are not to be blamed if they find such statements displeasing to them and they are not to be blamed if they protest.

Mrs. Eddy's friends know her to be a noble woman, who has given her life for others. She has endured, uncomplainingly, the sarcasm of the careless and the taunts of the malicious, but her followers may be pardoned if they refuse to keep silence when she is misjudged. When the term "Mother" is applied to Mrs Eddy with a contemptuous meaning it is distinctly offensive to Christian Scientists. This word was employed by Christian Scientists for many years to indicate their love for their leader, but when it began to be misapplied by the public press its use was discontinued, at Mrs. Eddy's request.

The publication of this protest will be much appreciated by all Christian Scientists who read *The American Architect.*

Yours very truly,

Willard S. Mattox.

[CONSIDERING that the whole body of Christian iconography and the entire output of ecclesiastical architecture have been evolved by technicians, architects and artists who have considered the depths of religious beliefs, we hold that "utterances" concerning such beliefs clearly are not "out of place in and inappropriate to the columns of a trade or technical paper." Our correspondent overlooks the fact that, had we acclaimed the theories and doings of the Christian Scientists as wholly admirable, we might have given offense to other readers of "The American Architect." We must disclaim the intention of offending anyone, while we must also maintain our right to the expression of an opinion.—Eds. "American Architect."]

Denver, Col., June 25, 1906.

The American Architect:—

In your article that I saw regarding the Christian Science Church of Boston, there are some things that are misleading.

You say that the church was dedicated free of debt. But in the case of contributions from Denver, Col., which were several thousand dollars, they were paid by continuing a debt of $40,000 on their home church.

This I would call "robbing Peter to pay Paul"

F. Goodnow.

ILLUSTRATIONS

THE NEW THEATER, 62D ST., CENTRAL PARK WEST AND 63D ST., NEW YORK, N. Y. MESSRS. CARRÈRE & HASTINGS, ARCHITECTS, NEW YORK, N. Y.

PLANS OF THE SAME: TWO PLATES.

SECTIONS OF THE SAME.

SEMI-DETACHED COTTAGES, GEORGETOWN, D. C.

TWO PLATES.

Additional Illustrations in the International Edition.

FRONT VIEW: "HOUSE IN THE WOODS," AMSTERDAM, HOLLAND.

REAR VIEW OF THE SAME.

THE RIJKS MUSEUM, AMSTERDAM, HOLLAND.

CARRIAGEWAY THROUGH THE SAME.

TOWN HALL, DELFT, HOLLAND.

THE CHURCH OF ST. NICHOLAS, AMSTERDAM, HOLLAND.

THE COLONIAL MUSEUM OR PAVILJOEN WELGELEGEN, HAARLEM, HOLLAND.

THE DELFT GATE, ROTTERDAM, HOLLAND.

NOTES AND CLIPPINGS

The Brandenburg Gate.—The Brandenburg Gate in Berlin was erected towards the close of the eighteenth century, and was rather suggestive of the city and of Prussia. It is a severe structure in Roman Doric, presenting six columns to the spectator on both approaches. It is surmounted by a quadriga of Victory in a chariot drawn by four horses, which was carried off by the French in 1806 and surrendered after the downfall of Napoleon. The building was flanked by two small houses similar in style, one of which was used as a toll-house and the other as a guard-house. Practically it continues the line of the buildings on both sides, and when it was erected it marked the boundary of Berlin. The wide roadway, Unter den Linden, opens out into a square before the gateway, which is known as the Pariser Platz, and thus recalls the part taken by the Prussians in conquering the French capital. Since 1814 Berlin has largely increased its area, and the Brandenburg Gate has not only ceased to express the boundary, but it is an obstacle to the fine view which might be obtained from the Schloss Bridge and the memorial of the first emperor. It has therefore been proposed to remove the buildings which adjoin the gate. There is no longer a necessity to examine and tax goods on entering the city, and the small customs-house is now a telegraph-office. A great many artists are opposed to the scheme, because it would alter an arrangement which has lasted for nearly 120 years, which in a new city like Berlin is a long period. The Architects' Union of Berlin has formally passed a resolution in favor of the continuance of the present arrangement. The gate has now a character of its own, and an alteration would suggest a desire to imitate the Arc de l'Etoile in Paris, although the two structures are unlike. A part of the official scheme is to construct a tunnel beneath the Platz, in order that the existing street railway might not interfere with the severity of the structure.—*The Architect.*

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THE last issue of *The Illuminating Engineer*, which, by the way, although it has reached only its fourth month of publication, promises to be an exceptionally useful publication, gives an interesting account of what may be considered the "last word" in incandescent lighting, an account which describes lighting by the Moore "Vacuum Tube," a method which promises to protect the eyesight of the human race by making illumination by reflection wonderfully even and simple. The process is based on the long-known fact that an electric current passed through a sufficiently tenuous gas enclosed against dissipation will raise such gas to a state of incandescence. This curious property of gases when acted on by the electric current has long been known and is always shown at lectures on the physics of electricity in the shape of the familiar experiments with Crookes's tubes. But owing to electrolytic action on the gas enclosed in a Crookes's tube the tension is gradually raised to a point where the resistance is too great and the electric illumination disappears. How to maintain the gas contained in a Crookes's tube permanently at just the right tension has occupied the attention of Mr. D. McFarlan Moore for the last twelve years, and it is only within the last eight months that he has solved his problem, and, as we said, has perfected a process and an apparatus which are real boons to mankind.

THE result of Mr. Moore's experiments is that a room may be lighted by running a vacuum-tube around it quite as if it were a steam-pipe suspended below the ceiling, the light issuing from every portion of the tube and giving a more even distribution than if the same amount of light proceeded from the scattered foci of the ordinary Edison incandescent lamps. Mr. Moore's medium is merely atmospheric air reduced by exhaustion to the proper tenuity, and he has solved the problem of keeping the contained air at the proper tension by inventing a species of pet-valve which automatically allows the introduction of enough air into the tube to maintain the resistance always at the proper point. The valve is so very clever, so absolutely automatic in its action that, in a certain way, the inventor may almost be said to have discovered perpetual motion. The valve is delightfully simple in its parts and direct in its operation. Roughly speaking, a short vertical tube connected with the vacuum-tube is plugged at the upper end with a cone of slightly porous carbon, all being enclosed in a still larger tube closed at the bottom so as to form a cup into which mercury is poured, in such an amount as to just cover the tip of the carbon plug after there shall have been lowered into the mercury from above a third tube, of intermediate size. The top of this third tube is, by various devices, connected with the wires furnishing the electric current in such a way that in proportion as the resistance in the vacuum-tube increases, owing to increasing rarefaction of the contained air, this third tube is slightly withdrawn and the level of the mercury in the cup falls, thus exposing above its surface the tip of the carbon plug, through which is at once, and automatically, forced by ordinary atmospheric pressure the infinitesimal amount of air which is needed to reduce the tension within the vacuum-tube. As all that has to be overcome is the friction between polished glass and mercury, and as the actual motion has to be of the very slightest, it seems plain that this valve, once properly adjusted, should secure to the user a perfectly continuous and even illumination. It seems to us that possibly this new form of incandescent light may be safer even than the Edison lamps for use in places where explosions are possible. It is known that the breaking of an Edison bulb in a flour-mill, in a coal-mine or in some other place where the air has been impregnated with fine dust has produced explosions, just as a similar breakage in the varnishing-room of a carriage-factory has produced a fire there. But it is possible that these fires and explosions may be due actually to the presence of the glowing carbon filament exposed for a moment by the breaking of the glass bulb, incandescent matter which has no counterpart in this new vacuum light.

ANOTHER good point about this new vacuum-tube light is that it is said to be, as used naturally, of a warm and mellow hue and that the spectrum of sunlight itself can practically be produced by the introduction into the tube of small quantities of certain permanent gases. Now it appears, on the authority of a discussion that is reported in the *"Transactions"* of the Illuminating Engineers' Society, that one of the real reasons why we are all having so much trouble with our eyes in these electrically lighted days, is that, according to Kuhne and other German physiologists, the rays that are peculiar to the Welsbach incandescent light and to certain forms of electric incandescence which yield an apparently very white light, are very destructive of the "visual purple" with which our retinas are coated. As the action of these white rays destroys the visual purple more rapidly than it can be regenerated, the physical fatigue of the eye results, and

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very likely serious permanent injury might be suffered by one unfortunate enough to have to work day and night in rooms illuminated by such rays.

ALTHOUGH to a considerable extent it is retelling a tale already twice told, it seems worth while to print in full the report handed down last June from the United States Court of Claims in the noted case of Smithmeyer & Pelz *vs.* the United States. At any rate, it brings the records of the case down to date. Moreover, should the claim be acted on favorably at the next session of Congress, it would carry with it, according to the phrasing of the bill, an official endorsement of the "Schedule of Charges" of the American Institute of Architects. The payment of this long-delayed claim, when made, will give the people a welcome assurance that their Government does not knowingly engage in swindling private individuals, however much certain super-serviceable officials may esteem such a course to be desirably and praiseworthily economical.

WE believe thoroughly that all laws ought to be enforced, so long as they stand as laws on our statute-books, and we believe in like way that the best way to bring about the expunging of undesirable laws is to enforce them, so that public protest may bring about their abolition. There have been for some years laws that the working-day for mechanics employed on Government work shall consist of eight hours only, but these laws have seldom, if ever, been enforced. How many contractors will be driven into bankruptcy through the sudden issuing, last week, by President Roosevelt of an "executive order" that these labor-laws must henceforward be observed to the letter, who can say? One thing at least seems clear: under this new executive order the ninety-one items included in the "omnibus Public Buildings bill," passed during the last session of Congress, may result in buildings eight-tenths as large, sixteen-twentieths as well built, four-fifths as architecturally satisfactory as they might have been under the former practice of allowing mechanics and contractors to come to an understanding about hours, without the intervention of an executive order.

WE wonder whether the "leaders of the profession" in Greater New York will quite relish the news that the new public library for Brooklyn, a building that is to cost two million dollars, is to be designed by an architect appointed, at his personal good pleasure, by the President of the Borough of Brooklyn. If Mr. Raymond F. Almirall, the selected architect, is not given to understand that, of all possible buildings, the Brooklyn Public Library is the very one which should form the subject of a public competition, then a real change of heart has befallen the architects in this community. We do not for a moment wish anyone to suspect that we feel that Mr. Almirall's is not a proper appointment, so far as his ability to produce a satisfactory design is concerned. But we do feel, in this case as in the case of all other public buildings, that the really proper and desirable method of securing an architect is through the agency of a "compound" competition. Moreover, in this case and others like it, it seems to us that such "direct appointment" is a clear infraction of that provision of the city's charter which forbids a city official to award any contract over a stated small value without public competition.

THOSE who have been opposing the establishment for San Francisco of a law setting the permissible height of a building at one and one-half times the width of the street upon which it fronts have been very misguided. For, quite apart from the fact that a high building in an "earthquake country" is, at least, less safe than the same structure would be in a country not subject to seismic shocks, the fact is that the modern "high building" is normal to and legitimate in only one environment—that which is afforded by an island of limited extent. At some period in the growth of an island city high buildings must be accepted as inevitable consequences of natural geographic limitations; but elsewhere they are but the evidence of thoughtlessness and selfishness. It is high time that the improvers of real estate and the founders of and surveyors for new towns should realize that they are using an antiquated unit, the common house-lot. The house-lot, like the width of the street, in this country has been determined by the fact that men had to go to and fro between their homes and their daily work upon their own legs; and, as men can devote only a small part of their day to mere locomotion, it was needful that houses should be set much nearer one another than less utilitarian requirements might have advised. With time and distance as two of the terms of a proportion, the size of the house-lot should be the third Since, then, in the same space of time the modern trolley-car enables a man to cover many times the distance he could when walking, logic and mathematics indicate that the other term, the area of the common house-lot, should be much greater than it used to be; and as a corollary the width of the streets could be proportionately greater. If this obviously rational system had been adopted, our cities would now cover greater areas than they do and the citizens would be living hygienically in isolated or semi-isolated homes in place of in blocks and rows, and as the width of the streets would also have increased, one and one-half times their widths would give as satisfactorily high-building limit as such a community could possibly need.

UNION labor has once more shown its appreciation of economic principles, in the way of a strike declared by the stonemasons employed on the new wing of the State-house at Trenton, N. J. Being thorough believers in the theory that home talent must be fully employed by those who live at home, the stonemasons demanded that no more of the stone used on the building should be dressed at the quarries by machinery, but should be sent to the building site in the rough, that they might have the pleasure—and the profit—of there shaping and dressing it at their leisure with hand tools, in the good old-fashioned way.

SMITHMEYER AND PELZ *vs.* THE UNITED STATES.[1]

[Court of Claims. Congressional, No. 11895. John L. Smithmeyer and Paul J. Pelz vs. The United States.]

STATEMENT OF CASE.

THE following bill was referred to the United States Court of Claims March 3, 1905, by resolution of the United States Senate, under an act of Congress approved March 3, 1887, known as the Tucker Act:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Treasury be, and he is hereby, authorized and directed to adjudicate and pay the claim of John L. Smithmeyer and Paul J. Pelz **for services in preparing the plans for the building of the Library of Congress, notwithstanding any statutes of limitations or any prior settlement or adjudication thereof, and in determining the amount due the rates and rules established by the custom and usage of the profession of architects for such service shall govern, and a sufficient sum to pay the amount found due is hereby appropriated out of any money in the Treasury not otherwise appropriated."**

The claimants appeared and filed their petition in this court on the 31st day of March, 1905, in which they make the following allegations:

1. That they and each of them are citizens of the United States and residents of the city of Washington, in the District of Columbia, and that in the year 1886 and for many years prior thereto, to wit, for thirteen or more years, they were engaged, in the District of Columbia and elsewhere, as copartners in the practice of their profession as architects.

2. That they have a claim against the United States for services rendered in the preparation of certain architectural plans upon which the Library of Congress was constructed, which said claim was, on the 3d day of March, 1905, referred to this court under the provisions of the fourteenth section of the act of Congress approved March 3, 1887, commonly called the "Tucker act."

3. The petitioners further allege that their claim referred to in said Senate bill No. 7220 arose under the following circumstances, to wit: Claimant, at the request of defendants through various committees of Congress and other duly constituted authorities, furnished to the defendants at various periods from 1873 to 1886 divers and sundry plans, drawings, etc., for the construction of the proposed Library of Congress; that in the year 1886, to wit, on the 15th day of April, the Congress of the United States passed an act entitled "An act authorizing the construction of a building for the accommodation of the Congressional Library," in which it was provided that said building should be constructed "substantially according to the plans submitted to the Joint Select Committee on Additional Accommodations for the Library of Congress by John L. Smithmeyer," one of the claimants herein, and that said building was constructed upon the plans prepared by claimants.

4. Claimants further allege that during the period from 1873 to 1886 they individually, and as a firm, devoted the greater portion of their entire time to formulating divers and sundry plans, both ground and elevation, at the request of the defendants through their duly constituted authorities, and that the plan, as finally adopted by Congress in the year 1886, was the culmination and result of, to wit, thirteen years of almost uninterrupted labor; that during all of said period claimants received no compensation whatever from the defendants for their work and labor performed by them or either of them; that during the whole of said period claimants maintained a large and expensive office, and that the expenses incurred by them incident to the preparation of said plans as finally adopted amounted to a very large sum, to wit, the sum of $75,000.

5. Claimants further allege that the building of said Library of Congress cost defendants a large amount, to wit, the sum of six million five hundred thousand dollars ($6,500,000), and that in equity and good conscience and according to the rules and customs of the profession of architects, and according to the reasonable and actual value of said plans, as prepared by claimants and as adopted and used by defendants, they, said claimants, should have been paid by the defendants an amount equal to two and one-half per cent. (2½) upon the cost of the said building, to wit, upon the sum of $6,500,000, but claimants allege that they have not been paid such sum, but have only been paid by the defendants the sum of $48,000.

The case was brought to a hearing on merits on the 7th day of May, 1906. Pennebaker & Jones, Esqs., appeared for the claimants, and the Attorney-General, by Felix Brannigan, Esq., his assistant, and under his direction, appeared for the defense and protection of the interests of the United States.

The Court, upon the evidence and after considering the briefs and arguments of counsel on both sides, makes the following

[1]These findings of the Court of Claims transmitted to the Senate June 27, 1906, referred to the Senate Committee on Claims and ordered to be printed. Action on the Bill will be had at the next session of Congress.

FINDINGS OF FACT.

I. The claimants, John L. Smithmeyer and Paul J. Pelz, both citizens of the United States and residents of the city of Washington, District of Columbia, were, at the times hereinafter mentioned, copartners practising their profession as architects, with their offices located in the said city.

II. From the year 1873 until the 15th of April, 1886, the claimants devoted their time as architects to the making of plans and drawings for a building for the Library of Congress. They acted under the direction and at the request of the commissions and committees of Congress mentioned in the following acts of Congress, viz: The Commission created by the Sundry Civil Appropriation Act, March 3, 1873 (17 Stat. L, 510-513); the Joint Committee on the Library of Congress, Sundry Civil Act, June 23, 1874 (18 Stat L., 204-226), and the Legislative Appropriation Act, August 15, 1876 (19 Stat. L., 143-168); the Commission on the Enlarged Accommodation for the Library of Congress (act April 3, 1878, 20 Stat. L., 35); the Joint Select Committee on Additional Acommodation for the Library of Congress, organized under the act of June 8, 1880 (21 Stat. L., 165), the Deficiency Act, March 3, 1881 (21 Stat. L., 414-424), and the Act of April 15, 1886 (24 Stat. L., 12).

III. The act of March 3, 1873, supra, provided for "a plan for a new library building for a Library of Congress," and the Commission appointed thereunder published an invitation to architects to furnish plans (not including detail or working plans), and offered the sum of $1,500 for such design as might be adjudged the best.

IV. During the ensuing thirteen years, that is to say, between March 3, 1873, and April 15, 1886, the claimants prepared for and submitted to different committees and commissions of Congress the following sets of plans, to wit:

(1) In reply to the prospectus mentioned in Finding III, a plan in the Italian Renaissance style of architecture, consisting of front and side elevation, first and second floor plan, and one section. There were twenty-eight competitors. Claimants were awarded first prize for excellence and were paid therefor the premium of $1,500.

(2) Shortly afterwards, at the request of the Committee on the Library, a new design, being a modification of the former, consisting of colored perspective, a front elevation and portion of first and second story plans, five drawings in all.

(3) About 1875, at the request of Senator Howe, chairman of the Joint Committee on the Library, a new set of plans in the Gothic style of architecture upon an entirely new basis. The series of drawings consisted of seven sketches, but four of which were submitted to the committee.

(4) Said Gothic plan was, at the following session of Congress, at the request of Senator Howe, chairman of the said committee, modified as to the exterior design. These drawings were five in number and were submitted to the committee.

(5) About 1877, at the request of Senator Howe, chairman of said committee, a new set of plans for the Library building in the French Renaissance style of architecture. These plans consisted of elevation framed and colored and a pencil study of front elevation. The interior arrangement was entirely changed from that of the Gothic design, owing to a proposed change of location from Capitol Hill to Judiciary Square. At the request of the committee, claimants prepared two cross sections of Judiciary Square with proposed building located, showing grades, sewers, etc. These plans were delivered to the said committee.

(6) At the request of the said committee, a design for the said building in the Romanesque style of architecture, with perspective elevations, three drawings in all, and they were submitted to said committee.

(7) About 1879, at the request of said committee, a design in the German Renaissance style of architecture, with finished perspective and eight other drawings, consisting of front, rear, and side elevation, and a full set of plans of the different stories, together with a section showing the halls and reading-rooms, all of which were fully developed. The study for the reading-room was an entirely new and original design and is the idea carried out in the building as constructed. There were also changes made in this set of plans, to wit: In the ground plan, and also changes showing higher development and greater elaboration of original ideas, and progress both as to the construction and light effect.

(8) In 1880 drawings for a building in the Italian Renaissance style of architecture, embodying all the improvements which had been made since 1873, consisting of forty finished drawings. These drawings were on a large working scale one-eighth of an inch to a foot and one-fourth of an inch to a foot. These plans, with exterior modifications as set forth in paragraph 10 below, are those adopted by act of Congress of April 15, 1886.

(9) In 1882 a revision of the Gothic plans above referred to in paragraphs 3 and 4 (**supra**) of this finding, showing perspective and front elevations. These revised plans were adopted by the Senate in a bill passed by that body, but which failed to pass the House.

(10) In 1885 a revision of the exterior of the Italian Renaissance plans described in paragraph 8 (**supra**) of this finding; no change

was made in the interior of the building, but the exterior was made more ornate. These plans consisted of perspectives, on a large scale, mainly for color effects according to the material used.

V. Claimants, in the year 1874, gave up their private business as architects, and from that time on until 1886, devoted themselves almost exclusively to the plans above described, and they never regained their private business.

In 1882 the claimant, Smithmeyer, traveled throughout this country and Europe, visiting different library buildings in New York, Boston, Philadelphia, Baltimore, Liverpool, London, Paris, Brussels, Vienna, Berlin, Dresden, Leipsic, and Hanover, at the request of the Joint Committee on the Library for the purpose of obtaining information in respect to the architecture of the great library buildings of the world. His expenses to the extent of only $800 were paid by said committee.

VI. The act of Congress approved April 15, 1886 (24 Stats. L., 12), authorized the construction of the Library building "substantially according to the plan submitted to the Joint Select Committee on Additional Accommodations for the Library of Congress by John L. Smithmeyer in the Italian Renaissance style of architecture, with such modifications as may be found necessary or advantageous without materially increasing the cost of the building."

On October 1, 1886, the Commission created thereunder employed the claimant, John L. Smithmeyer, architect for the construction of the New Congressional Library building, and fixed his compensation at $5,000 per annum, and on the 13th day of November, 1886, also employed the claimant, Paul J. Pelz, principal draughtsman, and fixed his compensation at $3,000 per annum. These employments were in writing, signed by the Commission, addressed, respectively, and delivered to the said Smithmeyer and Pelz.

Immediately upon the employment of these claimants they entered upon the performance of their respective duties, Smithmeyer as architect and Pelz as principal draughtsman, and continued to perform their respective duties in carrying out the plan theretofore accepted and adopted by the said act of Congress of April 15, 1886, in manner and form as therein contemplated, until removed from their employments, as set forth in the succeeding findings.

VII. The Sundry Civil Act approved October 2, 1888 (25 Stats. L., 505-523), abolished the said Commission created under the said act of Congress approved April 15, 1886, and it was provided therein that all appropriations theretofore and thereafter made for the construction of said Library building should be expended under the direction and supervision of the Chief of Engineers of the Army, who should have the control and management of all of the said work and the employment of all persons connected therewith. Said Sundry Civil Appropriation Act "rescinded . . . all contracts for work or materials not necessary for the execution of the work contemplated herein." It also authorized the Secretary of the Interior to "adjust, determine, and pay out of money appropriated therefor . . . all loss or damage occasioned" by said rescindment, "or arising under said contracts." It also specially authorized the said Secretary of the Interior to "adjust, determine, and pay out of the sum heretofore appropriated or hereby appropriated the value of a plan for a library building submitted to the Joint Select Committee on Additional Accommodations for the Library of Congress by John L. Smithmeyer in the Italian Renaissance style of architecture."

Immediately upon the passage of said act of Congress approved October 2, 1888, Thomas L. Casey, then Chief of Engineers of the Army, who was not and never claimed to be an architect, assumed and entered upon the duties imposed upon him by said act, and the next day, October 3, 1888, he removed the claimant, John L. Smithmeyer, from the office of architect of said Library building, but continued to employ the claimant, Paul J. Pelz, as his principal draughtsman until May 1, 1892, when he also dispensed with the services of said Pelz.

VIII. The plans submitted by the claimant, John L. Smithmeyer, and accepted by the Government as aforesaid, were adopted and followed throughout the whole construction of the Library building by the said Chief of Engineers, United States Army. These plans consisted of "preliminary sketch and general drawings" within the meaning of the schedule of prices adopted by the American Institute of Architects, which prices or fees were prescribed long before that time by the said Institute, and were the rule of compensation in the District of Columbia for architects of good standing in their profession, as in other parts of the United States. Said plans were so completed and perfected that they were used by those who completed the structure begun by claimants.

For such preliminary studies and general drawings, including specifications, the rate of remuneration prescribed by the American Institute of Architects (of which both claimants are members) is 2½ per cent. upon the cost of the work. An amount in excess of this percentage is fixed by said schedule for monumental buildings, etc. The Library of Congress is a monumental building within the meaning of this clause of said schedule.

At the time of the removal of said claimant, Smithmeyer, from his office as architect of said building, to wit, October 3, 1888, he had not completed the usual specifications for the whole building, and on account of said removal was unable to furnish said specifications. The reasonable value of the service of preparing the specifications for said building was $3,300.

IX. During the thirteen years in which claimants were engaged in the preparation of the various plans, which resulted in that adopted in 1886, and upon which the present Library building was constructed—that is, from 1873 to 1886—the claimants gave substantially their whole time and services to the various committees and commissions having charge of the subject of a library building, as is more particularly set forth in Finding IV., and they also furnished and paid the necessary draughtsmen and clerks and maintained an office for this purpose.

The cost of draughtsmen, clerks, materials, office rent, and incidental expenses incident to the business of an architect in good practice aggregates on an average about 50 per cent. of the gross receipts of such office.

The cost of preparing plans and specifications in the Office of the Supervising Architect of the Treasury is about 2½ per cent. of the cost of the building.

X. It is the custom where the Government of the United States employs private architects, in competition, to prepare plans and specifications and to superintend the construction of public buildings, to recognize the schedule of fees as fixed by the American Institute of Architects as being reasonable and fair, and to base the architect's compensation thereon.

Since the passage of the act of February 20, 1893, the Treasury Department has adopted the policy of constructing public buildings according to plans and specifications prepared by private architects, and the compensation as fixed by Treasury regulations is based upon the schedule of fees of the American Institute of Architects. The regulation referring thereto is as follows:

"Sec. 18. The architect or architects to whom said commission shall be awarded will receive in compensation for full professional services, including local supervision of the building, a fee computed at the rate of 5 per cent. of the cost of the work executed from his drawings and specifications and under his superintendence.

"Sec. 19. The architect's commission shall be paid, as the work progresses, in the following order:

"One-fifth of the fee when preliminary drawings are completed and approved in the manner herein provided; three-tenths of fee when general working drawings and specifications are completed and copies delivered to the Supervising Architect," making 2½ per cent. for working drawings and specifications.

XI. Pursuant to the provisions of the act of June 8, 1880 (21 Stat. L., 165), the claimant, Smithmeyer, was appointed upon a commission to determine whether it was practical or beneficial to provide additional library space in the Capitol building, or, preferably, to erect a separate building. For his personal services rendered under the employment, including $800 for expenses to Europe, as set forth in Finding V, the claimant, Smithmeyer, was paid the sum of $6,397.88.

No payment of any character whatsoever was ever made to the firm of Pelz and Smithmeyer for services rendered in and about the preparation of the plans for the Library of Congress other than the $1,500 premium, as set forth in Finding IV., except as hereinafter appears.

Both claimants, however, received their respective salaries from the date of their appointment to the date of their discharge.

The services rendered by claimants in and about the preparation of said plans ceased upon the passage of the act of April 15, 1886, whereby the said plans were adopted. From that time until their respective appointments, to wit, to October 1, and November 12, 1886, respectively, claimants had no official or professional relations of any kind with the Government of the United States.

No express contract or agreement was entered into between the claimants and any one of the various commissions or committees or other authorities of the United States looking to the compensation of the claimants for services in the preparation of said plans between the year 1873 and the 15th of April, 1886.

XII. On January 14, 1889, the claimants herein filed their petitions in this Court and thereafter, on April 22, 1889, they filed their amended petition, wherein they claimed a commission of 2½ per cent. on the cost of the construction of said library building "for preliminary studies, general drawings, and specifications," as prescribed by the schedule of charges of the American Institute of Architects. A judgment was rendered in their favor in said cause for $48,000 on the basis of quantum meruit, they having agreed to accept salaries of $5,000 and $3,000 per year, making in all $8,000, in lieu of the rates prescribed by the American Institute of Architects (25 C. Cls. R., 481) for architects during the construction of the building.

The judgment so rendered was appealed from to the Supreme Court of the United States and said judgment was affirmed, the Court holding that the decision of the Court of Claims was proper and reasonable (147 U. S. R., 342).

The amount of judgment so rendered was paid to the claimants and accepted by them, so far as appears, without protest or objection. If the account were settled upon the basis of the schedule of prices fixed by the American Institute of Architects, it would stand as follows:

2½ per cent. commission on $6,394,585.34, the total cost of the building		$159,864.63
Less the cost of preparing specifications	$3,000.00	
Less amount of judgment paid as above stated	48,000.00	
		51,300.00
Leaving a balance of		$108,564.63

Filed June 8, 1906.

BY THE COURT.

A true copy.
Test this 26th day of June, A. D. 1906.

[Seal.] ARCHIBALD HOPKINS,
Chief Clerk Court of Claims.

ITALIAN CITIES[1]—XVII.

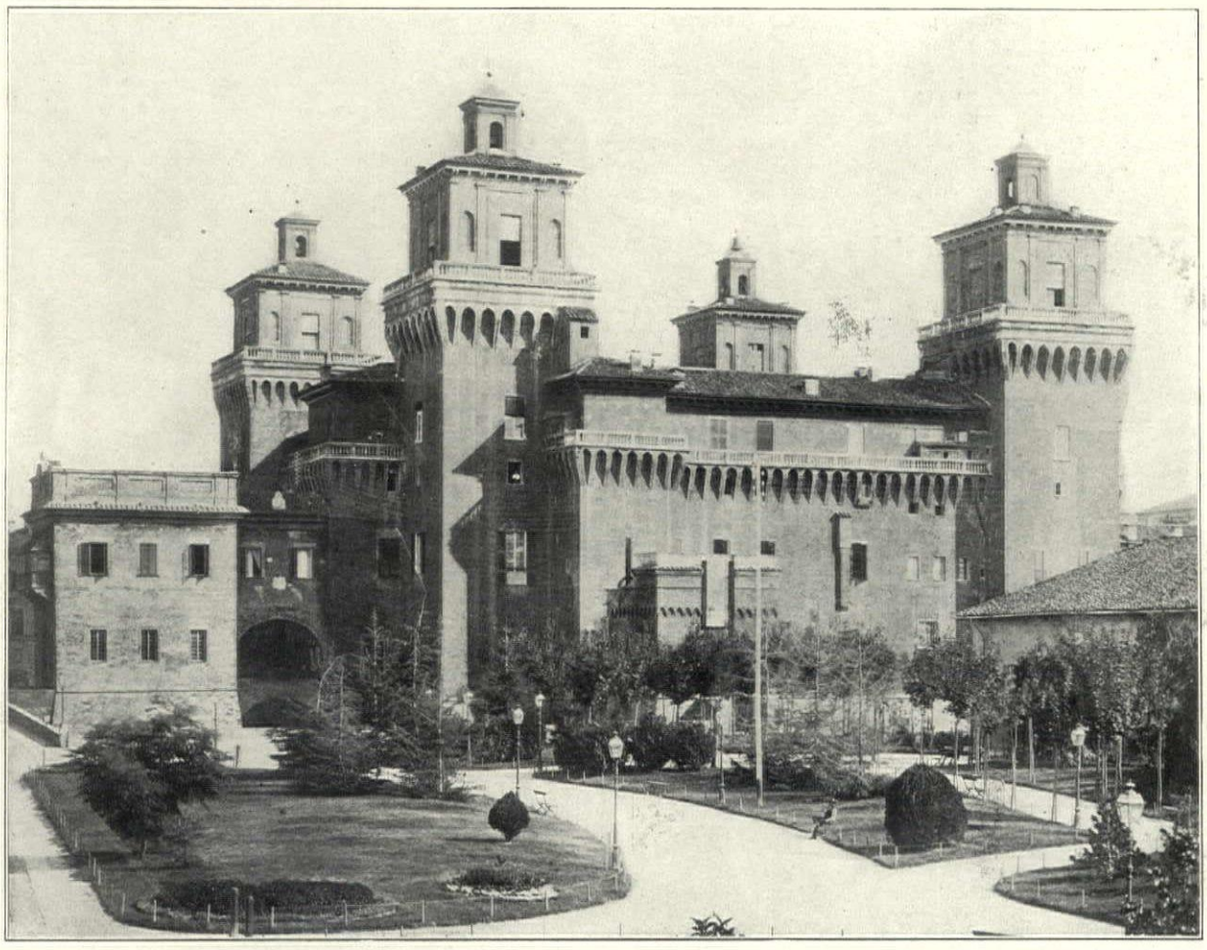
FERRARA—III.

BESIDES its churches, Ferrara possesses some splendid examples of civil architecture, the great part of which belong to that splendid period of the Renaissance that made of this city one of the most artistic centers in Italy.

The most imposing, from the point of view of mere mass, of the palaces in the city is, without contradiction, the Castello or "Castle Vecchio"; it is a remarkable specimen of military architecture. On St. Michael's Day in the year 1385, the first stone was laid and the ardor of the workmen was so great that at the end of the sixteenth month the fortress was wholly finished, formidable, as it is to-day, with its towers, its thick walls and the whole panoply of its brutal forcefulness. It was the work of Bartolino de Novara, who connected the towers by strong crenelated walls, surrounded the whole structure with a deep moat filled with water and hung bristling draw-bridges before the two doorways which alone give access to the castle.

It was at the end of a popular uprising, in which his life had been in danger, that the Marquis Nicolo formed the resolution of building a sure asylum, which he thitherto had lacked. At that time the structure formed part of the fortified walls; its physiognomy has changed but slightly and it now stands just as it was restored after the earthquake that occurred in 1570. It was in the reign of Alfonso I that the most notable embellishments were made in the old feudal castle which, as civilization bloomed, became less repellent: its crenelations were transformed into parapets, its *chemins de ronde* into flat roofs and a hanging-garden was created there at the cost of much fatigue.

A large number of Ferrarese masters labored to embellish with their paintings or frescos the castle's vast halls. The greater number of the works which were at that time assembled there are now scattered through the art-galleries of Europe; but there remain, nevertheless, enough of the original works to win the regard of visitors. Paintings of the school of the Dossi, some even by Giovanni Dossi himself, still decorate the ceilings. In the Hall of Aurora, in the Tower of the Lions—the theater of abominable crimes and the place where are found the dungeon cells wherein Parasina Malatesta and Ugo d'Este were put to death—Giovanni Dossi depicted certain allegories: dawn, mid-day, evening and night. A little room opening upon the terrace contains the frescos that are most admired, the work, doubtless, of Girolamo da Carpi. They represent Ariadne seated in a chariot; a vintage and the triumph of Bacchus and Ariadne. The general style of composition is pretentious and from the walls of the castle gleam the most varied scenes of Roman and Greek antiquity and out of doors sports.

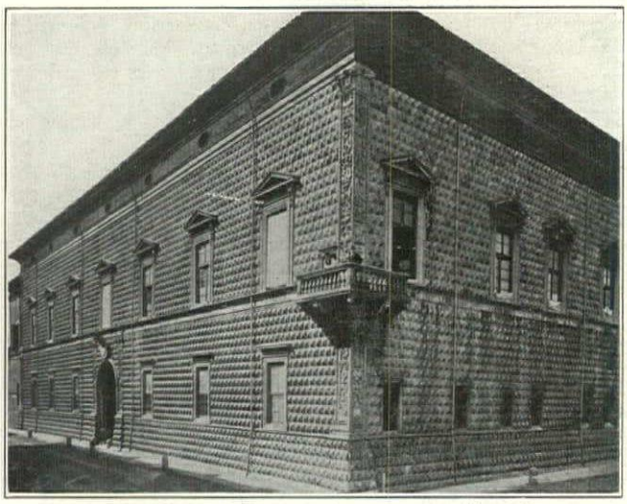


THE CASTLE VECCHIO, FERRARA.

The Palazzo dei Diamanti was built by Sigismondo d'Este, the brother of Ercole I. The architect was Biagio Rossetti and the sculptor Gabriele Frisoni, but, as earlier engagements prevented their completing the task, it was finished by two other architects. This palace, as its name indicates, is one of the richest, but it is also one of the strangest. To the traveler's eye it appears like a huge block of wrought marble. But, according to the most reliable statistics, its two fronts are covered by 12,600 great slabs cut in facets. It was because of the love of Ercole I for diamonds that this decorative treatment was adopted. The palace has only a single story, yet it is divided longitudinally into two parts. The doorway, of the seventeenth century, is not particularly fine, but the pilaster at the corner is noteworthy: like all the work that dates

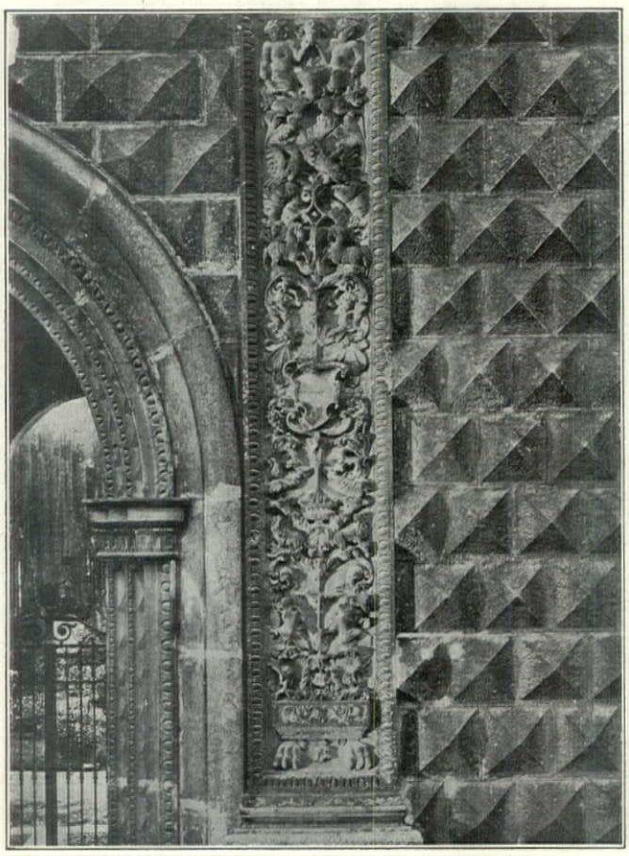
[1]Continued from page 218, No. 1592.

from this time, an epoch which was really under the generous and enlightened protection of the princes of the House of Este, the golden age of Ferrara, it is perfect in its kind; all the details, even the most minute, are carefully finished. At the height of the



THE PALAZZO DEI DIAMANTI, FERRARA [1493].

first story, it is cut by a balcony borne on five carved consoles, and is finished at the top with a graceful capital. At the end of the palace, two other pilasters run up to the entablature. The windows of the lower story are furnished with straight lintels; those of the story above have triangular pediments. In spite of the richness of certain details it must be conceded that the Palazzo dei Diamanti is not very satisfactory; it is massive, but heavy. The slender elegance of the pilasters and the angle balcony are not enough to lighten the effect and contrast rather unhappily



DETAIL FROM THE PALAZZO DEI DIAMANTI, FERRARA.

with the lumbering air of the ensemble. Within, some of the rooms have retained their paintings, but the most important of the frescos have been transferred to the museum of the city of Modena.

The Palazzo Sacrati, or the "Palace of the Lions," is separated from the Palazzo dei Diamanti only by the width of the street. It was built at the cost of a member of the Castelli family—as is proved by the castle engraved on the last step but one of the *perron*—toward the end of the XVth century by an unknown architect. The building is justly celebrated because of its doorway, to-day no longer in use, but inaccessible behind a railing. The architectural embellishments of this doorway, in red marble, stand out effectively against the grayish brickwork of the walls. Upon each side is a couchant lion cut also in red marble. The risers of the six steps are finely decorated in niello work. The archivolt of the doorway, with its delicate moldings, rests upon pilaster capitals decorated with vases and garlands, while rosettes garnish the intrados of the arch. In the spandrels are roundels from which project the heads of two warriors, in high relief.

Above the highly decorated entablature that is borne by two Corinthian columns hangs a balcony which receives an indirect support from this entablature, while seated nonchalantly on the cornice, with legs dangling down, are half a dozen little naked infants, resting their shoulders against the floor of the balcony, while the central console is supported on either hand by two other infants, who play the part of Atlantes. The faces of the square posts in the balcony railing are delicately carved, and their position is marked at the upper rail by two smaller groups of children, two warriors' heads and an ape, seated sideways, in the middle. All this work is in a very excellent state of preservation. The palace is further decorated with pilasters in yellow marble veined with red, at each angle, which the chisel of an unknown artist has embellished with dolphins, garlands, etc.

The city of Farrara is at this moment proprietor of the Palazzo Schifanoja, an Italian "Sans-Souci" that was built at the order of Alberto d'Este. At first it consisted only of a ground floor, but later Borso added to it an upper story. Pietro Benvenvti began the work in 1466. The doorway, executed in Istrian marble, is admirably carried out, doubtless after the design of Cosimo Tura. The pillars which adorn it are very fine, being decorated with a happy mélange of infants, chimeras, garlands, eagles, dogs, fruits and interlacing branches, decorations clearly due to the

DOORWAY OF THE PALAZZO SACRATI, FERRARA.

hand of an artist of great talent, who possessed all the secrets of the masters and ability and great conscientiousness as well. The unicorn, a symbol that can also be found on the coins of the princes of the House of Este and which Borso had wrought into his coat-of-arms, shows that this prince was the contemporary of the artist, whose name has not come down to us.

Ercole made every effort to embellish this residence, which he

inhabited at different times and wherein he gave fêtes in honor of the illustrious guests who visited him. Every form of luxury known to the Renaissance here mingled: rich vases and furniture, splendid brocades, and the most perfect of tapestries contributed to make Schifanoja the sumptuous asylum of joy and art, where even the floors were paved with colored Majolica tiles. We can still admire the wooden ceilings and the stucco ornamentation executed with superlative skill. But the thing that has contributed most to the fame of Schifanoja, in modern times, is the frescos, in which we see again the hand of Cosimo Tura and Francesco Cossa, frescos that for two centuries were hid behind a coat of whitewash! These frescos depict the twelve months of the year, the signs of the Zodiac and certain Pagan divinities, and in twelve compartments as many scenes from Ferrarese life and likewise portraits of various personages of the times. Consequently they have an unusual importance, since they record the customs of the day, its fêtes and diversions, and the costumes and social life of the citizens. Duke Borso himself is shown—now in the midst of magnificent parade spectacles, and again engaged in the ordinary discharge of his duties as ruler. Here, we see him setting out for the chase, followed by his escort, while a dog points some ducks in a pool and a groom leads a horse to water. There, he is seen returning from the chase, mounted on a white horse, while one of his attendants fondles a falcon. What is particularly striking in these frescos is the beauty and precision of the portraiture. All the great personages of the times are to be found on these walls, with physiognomies and characteristics clearly indicated, a thing which it is by no means easy to do. More than this, the details of country life—and this is altogether a novelty—occupy a considerable share of the space. Here, they are pruning the vine, cultivating it, and finally the vintage; there, peasants are making hay and pitching it onto the carts; alongside, women are washing linen, while cattle are straying along through the fields, and villagers are unloading barley from a wagon. In short, the artists have mingled scenes from civil and court life with the daily doings of the countryside, and they have done it with so strong a love for nature that we must bitterly regret the deplorable state of preservation in which we find these frescos, which are really amongst the most significant in the whole history of Italian painting.

The present Municipal Palace, formerly the Palace of the Este Princes, has been entirely transformed, and very little remains of its former splendor. On the lower story of the north side we must, however, notice the loggia of the Cameroni, a Doric portico that dates from about the middle of the sixteenth century. At one side a marble staircase is much admired because of the six cannellated columns on which rest the irregular arches that support the treads. The interior deserves little attention, except one hall, of which the wooden paneling is decorated with delicate and infinitely gracious paintings, supposed to be the work of Castello.

The Palazzo della Ragione, remodeled into a palais de justice, has undergone the vicissitudes of time; a fire once damaged it badly, while the earthquake of 1570 that caused much injury to the neighborhood was a source of ruin for it, and finally in the last century it was entirely rebuilt. Those charged with this work conformed as closely as they could to indications found in drawings in the archives and faithfully endeavored to give it its primitive aspect. The façade, in the Gothic style, is crowned with brick crenelations and rests upon nine arches.

The Palazzo Costabili is in deplorable condition and serves to house the poorest of tenants, whose ragged clothes stream from every window. The loggias have been walled up, though the elegance of pilaster and capital is still discernible. The courtyard on two sides is fronted by a double row of arcades, and between the arches of the lower ones are piers decorated with arabesques. An imposing cornice crowns the structure. Besides these, many other palaces and houses in this city bear witness to exquisite taste in matters of architecture and sculpture. One more building calls for notice, the Palazzo Roverella; its proportions are harmonious and its façade agreeable to the eye. The doorway, marble, is very simple. And finally I must speak of the house of Ariosto, which is remarkable for nothing else than that it sheltered one of the greatest of Italian poets and was erected at his cost. It bears in the pediment a Latin inscription which may be translated: "A small house, yet built for my convenience, having a certain neat elegance, yet stealing no man's sunlight: moreover, it was paid for with my own money."

The Princes of the House of Este, whose enormous resources hardly sufficed for their prodigalities, possessed, besides a large number of other palaces, many *palazzine*, country-houses and pleasure-houses to which they resorted from time to time to rest from their fatigues. Of all these, not one is left. Among them was the Palazzo Belfiore, begun by Alberto d'Este and finished by Lionello, who there established his famous cabinet, or museum. Then there was "Belrigardo," and "Belvedere," with its woods and antique baths, its menagerie and all sorts of diversions, and there was "Mesola," a fruitful hunting-ground which, with its dependencies, was inclosed within a ring-fence that measured twelve miles.

HONORÉ MEREU.

COLORED EXTERIOR DECORATION.

IT has been the rule to take it for granted that in smoky London, and in other large manufacturing towns, the buildings must be more or less smoke colored. We have grown accustomed to the somewhat dreary monotony of the color (or want of color) of our streets, and ceased to look for anything fresh. Those of us who, after traveling abroad, have become aware that such a thing as polychromatic exterior decoration really does exist have been wont to say with a shrug that that kind of thing looks very well in a bright atmosphere, or in a dry climate, but, after all, what can be done in the English damp and grey? Terra-cotta speedily becomes so dirty that it hardly tells as color; and stone soon loses all trace of its original hue; even granite, if it is not polished, becomes in time as grimy as the rest; while, as for paint and other forms of surface decoration, the less said the better about them after they have been up a little while. We must, we declare, just resign ourselves to the inevitable, and put up with the dinginess of our surroundings as best we may, and frankly own that, owing to our unfortunate climate, all beauty save that of form must be denied to us. This attitude may not be very cheering or very helpful, but it is certainly common. The great revival of interest in municipal affairs which has taken place of recent years has made the question of the aspect of our streets, in London and elsewhere, a far more burning and more popular one than it used to be. People have awakened to the realization that even in England, and in a manufacturing city, it is possible to consider the appearance of the town as a whole and to erect buildings which have some other merit beyond that of being adequate to the purely utilitarian requirements of the business to be carried on in them. Various efforts have been made, and are being made, both by public bodies and private individuals, to better the existing state of things, and one of the rather tentative attempts to get away from the influence of the all-pervading dirt has manifested itself in the use of colored glazed tiles in exterior decoration. Of course glazed tiles or bricks were employed in the East before the days of Darius, and have been a more or less common form of wall-covering in different parts of the world through the course of the centuries; but the use of such colored tiles or bricks, as well as of what is known in the trade as "faience" (*i.e.*, friezes, capitals, etc., made in clay and coated with a colored glaze or enamel), for exterior decoration, is an innovation in this country. For some years past plain salt-glazed bricks have been used in increasing quantities in the building of warehouses, etc., and, though the tone of such bricks is naturally very much restricted as to range, they sometimes make quite fine color, and they generally at least hold their own among the surrounding unglazed brick and stone. Again, a regular method of decorating the exterior of public houses and eating-houses nowadays is to employ colored tiles, sometimes in a plain or mottled color, sometimes painted with landscape or figure subjects. The colors used are naturally at times more gaudy than beautiful, and the pictures may not always be models of what pictorial ceramic art should be, but few people will be prepared to deny that, taking it all round, and in spite of the pretentiousness of some of the decoration, the result is less shabby and squalid in appearance than the old-fashioned public house exterior. If we turn to buildings of more importance, and greater pretensions, we find that colored glazes have begun to take a place, and at times a very important place, in their adornment and decoration in London, Manchester, and other large towns. A most successful instance in London is the porch of the children's hospital in the Waterloo-road. This porch, the gift of Mr. Lewis Doulton, is entirely built up of glazed ware in a broken green color strongly reminiscent of serpentine. It is an important structure, and is quite a feature not only of the hospital buildings, but in the street, and the effect of the mottled green surface is most satisfactory. Again, the Savoy Hotel is not only roofed with brightish green tiles, but it is faced on the Strand side with enameled terra-cotta slabs. The pinkish body color grinning, more or less, through the opaque white tin enamel with which it is coated, produces a very pleasing variety of

tint, and the effect of the long line of building covered with delicate color rather of the quality of the inside of an oyster shell, is quite charming enough to make the passer-by regret that the point of view from which he can see it best is the top of an omnibus. There is here nothing very pronounced in the way of color, but what color there is tells, and that after some years of London smoke, and without the aid of patent cleaning apparatus.

It is now rather over four years since Mr. Halsey Ricardo read a paper before the Society of Arts on "The Architect's Use of Enameled Tiles," in which he contended vigorously for the use of glazed tiles and bricks in exterior decoration, not merely as patches of color, but as the covering of the whole building, and stated that while he would like to see "whole streets treated in permanent color" he hoped "to see the scheme tried on a detached building standing free and with some trees about it." It is not many people who have the chance of realizing their own hopes so completely as Mr. Ricardo has been able to do. It has fallen to his lot to build a house in Addison Road which answers to his requirements in all particulars. It is detached, it stands free, and it has a background of trees. On the other hand, if the opportunity has been offered the architect has not shrunk from taking it, and has put his theories into practice with thorough-going completeness. The exterior from roof to basement is covered with glazed bricks and enameled blocks. The main surfaces are coated with colored glazed bricks, while the pilasters, which are a feature of the side elevation, as well as the mouldings of the arches and the other architectural details, are in blocks of enameled terra-cotta, and a certain amount of the same material is introduced into the wall space, more especially in the front of the house, where the opaque whitish color is broken by bands of yellow green slabs. The bricks used are not coated with tin enamel merely, but with brilliant glazes. The lower portion of the house is full rich green, the spandrels between the arched windows and the square lines of the pilasters and cornice in deep blue and the story above the cornice in rather lighter blue. The very chimney-stacks are of bright blue bricks edged with enameled terra-cotta. The color-scheme sounds startling enough, but there is nothing staring about the general effect, for the bricks, whether by accident or design, have been so placed as to present a large surface of flat, unbroken color, and in places they vary in tint quite considerably, while in the top story two shades of blue seem to have been employed deliberately. The roofing tiles, too, have been carefully considered, and, like those on the Savoy Hotel, are bright green, a color which, though one sometimes meets it abroad, is still quite uncommon on this side of the Channel. Altogether the house is strikingly unlike the ordinary "detached residences" which surround it; but its character is its own, and it does not look, as we might naturally expect such a building to do, like a bit of Eastern, or even of Italian or Spanish building planted in a Western or English *milieu*. It holds its own as different from its neighbors, as a trifle strange it may be, but not as a foreign product; and it is a remarkable experiment in a type of building hitherto unknown in this country. The problem of colored exterior decoration has been before us for some years. Mr. Ricardo has attacked it with energy and discretion. The lead having once been given, it remains to be seen if it will be followed up.—*Journal of the Society of Arts.*

ILLUSTRATIONS

CATHEDRAL OF THE SACRED HEART, NEWARK, N. J. MESSRS. JEREMIAH O'ROURKE & SONS, ARCHITECTS, NEWARK, N. J.

WEST FRONT OF THE SAME.

NORTH SIDE OF THE SAME.

PLAN AND EAST ELEVATION OF THE SAME.

CROSS SECTION THROUGH TRANSEPTS OF THE SAME.

CROSS SECTION THROUGH NAVE OF THE SAME.

DETAILS OF TRANSEPT GABLE OF THE SAME.

DETAILS OF WINDOW IN NAVE GABLE OF THE SAME.

PEOPLE'S TRUST COMPANY'S BUILDING, MONTAGUE STREET, BROOKLYN N. Y. MESSRS. MOWBRAY & UFFINGER, ARCHITECTS, NEW YORK, N. Y.

INTERIOR VIEWS IN THE SAME.

HOUSE OF R. J. FOSTER, ESQ., SCRANTON, PA. MR. W. SCOTT COLLINS, ARCHITECT, SCRANTON, PA.

Additional Illustrations in the International Edition.

MONUMENT TO GENERAL W. T. SHERMAN, WASHINGTON, D. C. THE LATE CARL ROHL-SMITH, SCULPTOR.

This monument, which was erected two or three years ago, facing the south front of the Treasury Building, by the Armies of the Cumberland and the Tennessee, has had a rather varied history and an unusually complex authorship. Because of Mr. Rohl-Smith's death, in 1900, the completion of the equestrian figure had to be placed in the hands of Mr. Lauritz Jensen, of Copenhagen; one of the pedestrian figures was modeled by Sigvald Asbjornsen, of Chicago, and Mrs. Kitson did some of the medallions. The two groups, "Peace" and "War," were modeled in part by Stephan Sinding, a Danish sculptor, who expected to come to this country and complete the work; but being prevented he sent in his place Carl J. Bonnesen, who finished the "Peace," but, falling ill, had to leave the "War" group to be finished by Mr. Asbjornsen. Thus it is seen that there is much more of Danish than of American art in the memorial. The early history of the undertaking was as stormy as its latter fate was varied. Really, the successful completion of the monument is due in no small measure to the courage and loyal affection of the sculptor's widow.

NOTES AND CLIPPINGS

EXCAVATIONS AT JERUSALEM.—It is announced that Professor Benjamin W. Bacon, of the Yale Theological School, who for the last year has been Director of the American School of Archæology at Jerusalem, will return in the coming college vacation, and his successor as director of the school for the coming year will be Professor David G. Lyon, of Harvard. Application has been made to the Turkish government for permission to make archæological excavations outside of Jerusalem, and they will be begun in the coming year, if the permit is granted.—*Exchange.*

ARCHÆOLOGICAL DISCOVERIES IN CHINESE TURKESTAN.—Professor Pischel, before a general meeting of the Academy of Science, June 12, read a letter from Professor Grünwedel, chief of the Prussian exploring expedition in Chinese Turkestan, dated February 21, at Komtura, near Kurtscha. The writer described archæological discoveries made in the Cave of Tienples, indicating that the founders of the temples were a red-haired, blue-eyed race and wore Persian costumes. Huge iron swords were found and also important manuscripts of the Ming period, a Buddhist pantheon and ancient frescos. Professor Grünwedel alludes to the results of De Lecoq's investigations, and says he, Grünwedel, is gathering ethnographic materials richer than any previously discovered, especially potteries and embroideries.—*Exchange.*

SANITATION AND MALARIA.—What can be done by sanitation to stamp out malaria is shown by Mr. Consul Morgan in his reference (No. 3,565, Annual Series) to the work of the Italian Red Cross Society during late years to stamp out malaria in the Roman Campagna. The first attempt was made in 1900, when the returns showed that not less than 31 per cent. of the inhabitants of the "Agro Romano" had been fever-stricken. In 1901 the figure was returned at 26, 20 in 1902, 11 in 1903, 10 in 1904, and 5.1 during last year. These results were obtained by strict sanitary measures, use of wire nets so as to prevent access of mosquitoes to cottages, and free distribution of quinine among the peasantry. During the summer months a number of doctors belonging to the Red Cross Society take up their posts in the malarial districts in order to administer the necessary antidote as well as to show the people how to protect themselves from infection. The expenditure required for the effective operation of the organization is partly paid out of the King's privy purse, and partly by the provincial and municipal authorities.—*Journal of the Society of Arts.*

PORTLAND CEMENT OUTPUT.—According to a bulletin issued by the United States Geological Survey, the production of Portland cement in 1905 amounted to 55,246,812 barrels, valued at $33,245,867, which represents a gain of 8,740,931 barrels in quantity and $9,890,748 in value over 1904.

UNHAPPY STATUES.—The vast majority of modern statues have all the unhappy look of a man who has left his umbrella at home for ever.—*The Academy.*

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SOCIETIES, PERSONAL MENTION, ETC.

THE Seventh International Congress of Architects seems to have been, so far as attendance goes, astonishingly successful, there being said to have been in attendance no less than seven hundred foreign visitors, while at the reception at the Royal Academy some three thousand persons were present during the evening. We imagine that in both cases the figures must have included the ladies unofficially accompanying the architectural delegates. A congress held in the world's metropolitan city should be very attractive, but, somehow, the English climate and the English language have usually been found to have for Continentals a repulsive rather than attractive force. The abstracts of the stated proceedings that appear in the current architectural periodicals seem to have been prepared with a view of eliminating every trace of individuality of expression on the part of those who had prepared papers, or who took part in the discussion.

IT is unfortunate that there is not in operation some sort of an international clearing-house for conventions and congresses. If there had been, it would have been perceived that it would be judicious, if the presence of American architects were desired, to hold the Second International Congress of the Association for the Promotion of Hygiene and Salubrity in Dwellings not very many days after the date of the International Congress of Architects in London, in July, where, obviously, many American delegates would assemble. In place of this, the promoters of the Hygienic Congress have arranged their meeting to be held at Geneva, Switzerland, from the fourth to the tenth of September, and it is hardly likely that the American architects now in London have made plans to remain abroad long enough to enable them to take in the Swiss meeting. This is rather unfortunate, for, as Americans are building vastly more dwelling-houses of all kinds than are other peoples, and those who build them are not disregardful of hygienic conditions, they should be able to contribute interesting and valuable papers at such a meeting as is to be held in Geneva.

MANY a man has gone to the scaffold on the strength of his being declared to be the assailant by the ante-mortem statement of his victim. Yet, although four of the members of the Housesmiths' Union were identified as those who assaulted him by the unfortunate special policeman murdered at the Plaza Hotel in New York, a few weeks ago, they have been declared guiltless by the coroner and his selected jury! It is satisfactory to know that this remarkable finding does not estop the Grand Jury and the District-Attorney from making an independent inquiry and taking such action as the evidence may justify.

IT is very curious, too, that, while many have gone to the scaffold on the strength of circumstantial evidence, evidence far less trustworthy than that embodied in an ante-mortem statement, there probably never was a building-accident the cause of which, when determined in accordance with circumstantial evidence, was universally accepted as having been established beyond peradventure. While a jury will condemn a man to death simply because it would be possible for him to travel between the spot where he alleges he was at a stated time and the spot where murder was done at a certain other assumed time, they rarely can agree as to what part of a building gave away first and caused a collapse of the entire structure. For this reason it is doubtful whether it will ever be established with unchallengeable certainty just what it was that caused a building at South Framingham, Mass., to collapse on July 23, bringing about the death of thirteen workmen and the injury of eight or ten others. Just how the building was built, it is not possible to determine from the accounts that have reached us, but seemingly the contractors undertook to combine structural steel, concrete mixture and concrete blocks into a three-story building of considerable area in a country town where building operations are uncontrolled by established building ordinances. The presence of the "concrete block" may not be as ominous as some might think, for since the accident samples of these concrete blocks have been tested at the Watertown Arsenal and have there exhibited a satisfactory crushing strength.

WHATEVER the cause or causes, the disaster is a particularly depressing one, for, in addition to the fatalities and casualties, it has caused the entire collapse of the unfortunate architect of the building, who may, or may not, have been responsible for the accident. One thing, at least, is apparent from this and other accidents that have of late occurred in buildings where considerable amounts of concrete have been employed in one form or another: no architect or builder should allow himself to use concrete in building if he is likely to lose sight of the fact that its value as a building material turns absolutely and entirely on the completion of a definite chemical process and that, as it is possible only by chemical analysis to determine whether a chemical reaction has reached its limit, the integrity of the work must be assured by a de-

Entered at the Post-Office at New York as second-class matter.

liberateness in proceeding from one step to the next that is rather foreign to recent American methods of building. A concrete wall can be "run up" at great speed, but it, even if reinforced, can come down even more speedily if subjected to untimely strain. The larger number of concrete-building accidents are due not so much to inferior cement, unskilled mixing, or improper proportions as to the foolish and needless haste with which centers are struck by ignorant or reckless workmen.

IN one particular only was there a particle of good fortune to lighten the sombreness of this South Farmingham accident. The Ninth Regiment of the Massachusetts Militia happened to be encamped just outside the town and someone bethought himself to telephone to headquarters for aid, the result being that two companies seized upon the passing trolley-cars and so reached the scene of the accident within eleven minutes of the downfall. As there were amongst the officers and men many who in daily life are building mechanics, they were able to take hold of relief operations with a knowledge and prompt efficiency that would have been lacking in the crowd gathered from the sidewalks of a country town.

WHEN, two years ago, we had to record the death of Mr. B. T. Batsford, we took occasion to call attention to the fact that no inconsiderable share of the valuable work done by that well-known publisher of architectural books should be credited to the intelligent active-mindedness of his eldest son, Bradley, who perceived the vast possibilities of modern photographic processes as applied to architectural publication and, so, set about the development of the publishing side of the business with an industry, discrimination and determination which, as all English and American architects know, were crowned with distinguished success. At the age of sixty Mr. Bradley Batsford has himself just died, leaving to a younger brother and a nephew the task of carrying on the business and maintaining and improving the reputation of the house, already highly enviable.

THE singular discovery made within a few years in this country that a district-attorney is an official who can use, or misuse, powers of unsuspected magnitude has been accompanied with some very spectacular performances on the part of these officials in different parts of the country. Since the last election, Boston has been the scene of divers eccentric undertakings on the part of Mr J. B. Moran, a district-attorney who neglects no opportunity to acquire another coating of temporary notoriety, his favorite device being to summon to his office personages of dignity and serious occupation and then keep them waiting in his ante-room until it suits his pleasure to have them admitted to his presence. In pursuance of this practice he last week summoned the Boston School-house Commissioners and consumed several hours of their time because he believed evidence had been brought him that a sub-contractor on the Girls' Latin and Normal School buildings was cheating in the way he mixed the concrete required on the job. As the Commissioners, of course, have nothing to do with the work beyond approving the drawings and specifications of the selected architect, and awarding the contracts, the subjecting them, rather than the architects responsible for the execution of the contract, to interrogation is proof either of Mr. Moran's ignorance or further evidence of his ardor as a notoriety-seeker.

HAVING made his investigation, Mr. Moran addresses—publicly, as always—a letter to the Mayor and School-house Commissioners, in which he tells them the work already done should be ripped out and done over again properly, and incidentally details his evidence. On the report of a workman that the contractor was not using the amount of cement called for by the specification, Mr. Moran had the concrete-mixing machine watched for several days and so discovered, as alleged, that where four bags of cement should have been used only three and a half bags were actually emptied into the machine. From the stock-book kept on the job he discovered that some eighteen thousand-odd bags of cement had been delivered, and he also ascertained how many batches of concrete had been run out of the machines. It was therefore easy to compute the number of bags of cement that ought to have been used and the number of bags still awaiting use on the premises. A count of unused bags is said to show that there were nearly twelve hundred more unused bags than there should have been, that evidently the concrete used was by so much poorer than the architect intended it to be, and that, inferentially, the sub-contractor was preparing to make an illicit profit of some nine hundred dollars at the expense of the structural strength of the building. In all probability the concrete as mixed is sufficiently strong, as good concrete is often made with a smaller percentage of cement to aggregate, and very likely the contractor, if he actually did lessen the dose of cement in a batch, felt he could, without injury to the job, set his knowledge as a "practical man" against the theoretical knowledge of the architect who wrote the specification. The incident, however, shows how needful is the presence on the job of an alert-minded and active-bodied clerk-of-the-works empowered with full authority.

BOUNDARY suits between neighbors constitute probably the most productive part of the country lawyer's practice, and these give place in the city to suits for encroachment over the party-line, the cause in each case being often identical—the error of the surveyor. A case recently arose in Brooklyn, N. Y., which reveals an unusual and expeditious way of dealing with a case of encroachment. It was discovered that the party-wall of the new Eastern District High School accidentally encroached four inches on the adjacent lot. Ordinarily the aggrieved owner would penalize the trespasser heavily, even to the extent of causing him to tear down and rebuild, in addition to paying damages for the trespass. In this case, however, the city, through its Board of Education, simply institutes "condemnation proceedings" against the injured owner, acquires the four-inch strip, possibly for less than it is worth to its former owner, and, even at that, does not have to pay, since the judgment will have to be satisfied by the contractors.

SHORT METHOD OF CONSTRUCTING THREE-CENTERED ARCHES.

IN almost every book of modern architecture, especially of the French Renaissance, we find examples of the three-centered arches. It seems, therefore, important in designing or laying out doors, windows, stairs, etc., of an elliptical or oval form, with three centers, to have a quick method, without recurring to calculations or too complicated geometrical constructions. The same principle will be advantageous in laying out arches for bridges and in designing oval sewers. The following method may be found convenient and simple. It is based on the principle of constructing a circle which shall touch two given circles when a point on one of the circles is given.

A. The CIRCUMSCRIBED circle.

Paragraph 1. To construct a circle, Fig. 1 and Fig. 2, which

Fig. 1

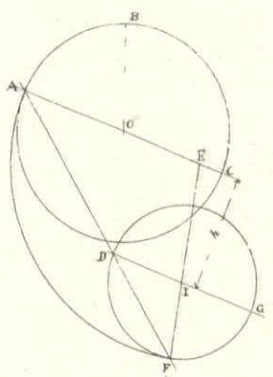
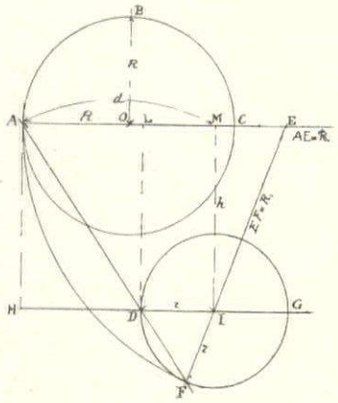


Fig. 2



shall touch a given point A of a circle and be tangent to another given circle, regardless of their relative positions.

Let *ABC* and *DFG* be the given circles and *A* the given point.

Draw *AC* through center *O* and *DG*, parallel to *AC*, through center *I*. From point *A* produce *AF* through *D*. Then *F* is the new tangent point on circle *DFG*. From *F* draw *FE* through *I*, intersecting line *AC* at *E*. Then *E* is the center of the circumscribed circle *AF*.

To prove that *AE=EF*:

PROOF.—The triangles *AEF* and *DIF* are similar, for *DI* is parallel to *AE*.

$\therefore AE:EF=DI:IF$, but $DI=IF$ as radii of circle *DFG*.

$\therefore AE:EF=I$.

Whence *AE=EF*.

Paragraph (2). In some cases it is desirable to find $EF=R_1$ by calculation.

In Fig. 2 let

$AO=R$

$DI=r$

$IM=h$ = perpendicular distance between AC and DG.

$AM=d$ = distance from given point A to center of second given circle.

In all cases the location of point A and the following dimensions are given or can be assumed: R, r, d, and h.

Find R_1 in Fig. 2:

$\overline{ME}^2+h^2=\overline{EI}^2$. . . .(1) but $ME=AE-AM$ and $EI=EF-IF$,

or $(R_1-d)^2+h^2=(R_1-r)^2$. . . .(2)

$\therefore R_1^2+d^2-2R_1d+h^2=R_1^2+r^2-2R_1r$. . . .(3) reducing

we have $d^2-r^2+h^2=2R_1(d-r)$. . . .(4)

but $d^2-r^2=(d+r)(d-r)$. . . .(5) inserted in (4)

we have $\frac{(d+r)(d-r)}{d-r}+\frac{h^2}{d-r}=2R_1$. . . .(6)

whence $R_1=\frac{1}{2}\left(\frac{h^2}{d-r}+d+r\right)$. . . .(7)

where $d-r=AL=HD$ and $d+r=HG$.

Fig 3 for d=2

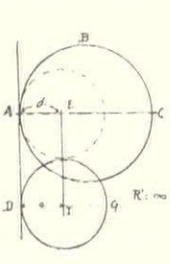


Fig 4 for h=0

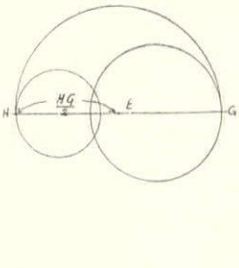
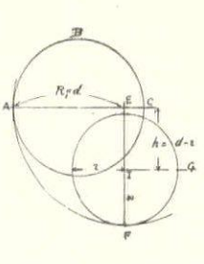


Fig 5 for h=d=2



Paragraph (3) COROLLARY:—If in equation 7 we made $d=r$ then $R_1=\infty$, and points A and D are either connected by a straight line tangent to both points, or point A coincides with point D, see Fig. 3.

If $h=0$ then $R_1=\frac{d+r}{2}=\frac{1}{2}$ GH, see Fig. 4.

If $h=d-r$ then $R_1=d$, or $AE=EF$ and angle $E=90°$, see Fig. 5.

If $h=3r$ and $d=2r$ then $R_1=6r$, see Fig. 6.

We will make use of this equation later on.

Fig. 6 for h=3r and d=2r

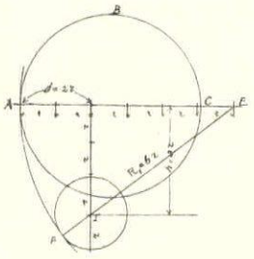
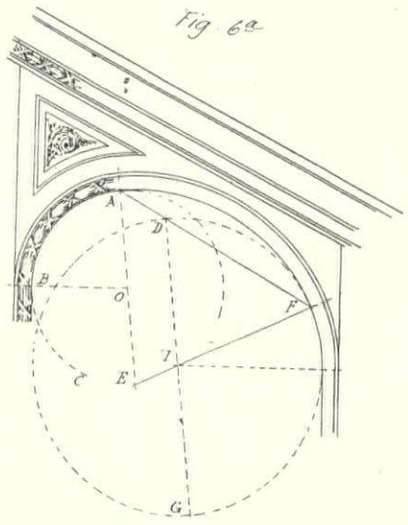


Fig. 6a



APPLICATION.

Paragraph 4. Fig. 6a shows the application of the method explained in Fig. 1, to an arch under a stair, the same letters having been used as in Fig. 1. Circle *ABC*, circle *DFG*, with their centers *O* and *I* and point *A* were assumed from a free-hand sketch. Produce *AO* and draw *DG* parallel to *AO* through *I*. Connect *AD* and produce it to *F*. Draw *FE* through *I* and *E* is the center for arc *AF*.

Fig 7

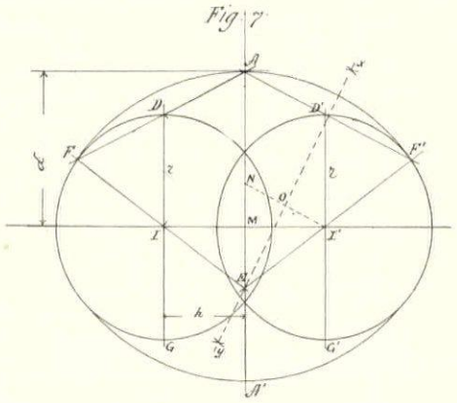


Figure 7 shows the application of this method in drawing a false ellipse or three-centered arch, when: The two equal circles *FDG* and *F'D'G'*, the distance *II'*, and the point *A* on the minor axis, are given.

Make *IM=I'M*, draw *AA'* at right angles to *II'*, *DG* and *D'G'* through centers *I* and *I'* of the two given circles parallel to *AA'*. From *A* draw line *AF* through *D*, and from *F* draw line *FE* through *I*, and *E* will be the center for arc *AFF'*, or bisect line *AF* or *AF'* and the bisector will pass through *E*, as shown in dotted lines.

This method will also prove the correctness of the usual way of drawing a false ellipse, when the above dimensions are given, namely: *rII'* and point *A*, as shown on the right-hand side in dotted lines. Draw *AA'* and *D'G'*, as stated above. Make *AN=r=I'D'*; draw line *NI'*, and through its center *O* draw perpendicular *xy* intersecting line *AA'* at *E*. Draw *EF'* through *I'*, and *F'* will be the point of the tangent for arc *AF'*.

PROOF.—As *NI'* is parallel to *AF'*, because *AN* is equal and parallel to *I'D'*, therefore the line bisecting *NI'* will also bisect *AF'*, making *F'* the tangent point and *E* the center of arc *AF'*.

Paragraph 5. In connection with the above figure it seems desirable to give a useful and simple construction of a false ellipse with three centers as shown in Fig. 7a when the semi-axes *AO* and *BO* only are given.

Draw AB, make $AC=BO-AO$. Bisect BC and the bisector will give center D for arc BF and center E for arc AF.

Proof is too long for insertion here, but will be furnished if desired.

Fig. 7a

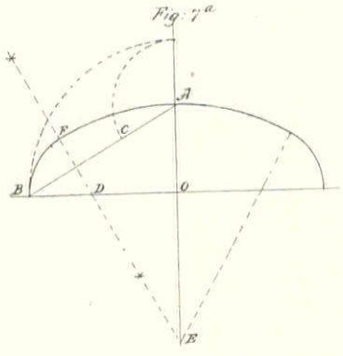
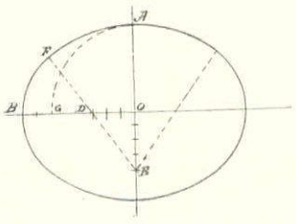


Fig. 7b

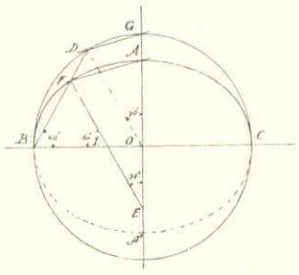


A very pleasing curve, Fig. 7b, is derived from Fig. 7a if the axes are assumed to be in proportion of 3:4; then $AO=3$, $BO=4$ and $BG=BO-AO=1$. Make $OD=3GB$; $OE=4\frac{GB}{2}=2GB$ and E and D will be the respective centers.

Another construction of a false ellipse with three centers is shown in Fig. 7c given: The semi-axes AO and BO and angle at $B=60°$.

Draw with BO from O as center, circle BGC. Make $BD=DO=BO$. Connect D with G and draw AF parallel to DG, intersecting line DB at F.

Fig 7c



From F draw FE parallel to DO, intersecting line BO at I and AA' at E as centers.

It is preferable for brick arches constructed with three centers to make the rise of the arch not less than one-third of the span.

Egg-shaped Figures.

Paragraph 6. The same method described in Paragraph 1 may be used in drawing egg-shaped figures, ovals, etc.

To draw a circle (Fig. 8) touching a given point A of circle ABC which shall be tangent to another given circle DFG. In this case line OI connecting the centers of the two circles is parallel to tangent AH, at point A, and the two circles may touch at point B, or not.

Proceed as stated before (see Fig. 1), by drawing line DG through I parallel to AC, then draw AF through D, and FE through I, and E will be the center of circle AF; or $AE=EF=R_1$.

Computation of R_1.

Paragraph 7.—In this case $d=R$ and $h=R+r$, see Fig. 2 and equation 7. Substituting in equation 7 which reads:

$R_1=\frac{1}{2}\left(\frac{h^2}{d-r}+d+r\right)$; $d=R$ and $h=R+r$, we have

$R_1=\frac{1}{2}\left[\frac{(R+r)^2}{R-r}+R+r\right]=\frac{1}{2}\left(\frac{R^2+2Rr+r^2}{R-r}+R+r\right)$ or

$R_1=\frac{1}{2}\left(\frac{R^2+2Rr+r^2+R^2-r^2}{R-r}\right)=\frac{1}{2}\left(\frac{2R^2+2Rr}{R-r}\right)$

whence $R_1=R\left(\frac{R+r}{R-r}\right)$ ..... (8)

If in equation 8, we make $R=2r$, then we have $R_1=3R=6r$, which is identical with equation given in Paragraph 4 for $h=3r$ and $d=2r$ and shown in Fig. 6, and generally used in the construction of egg-shaped sewers.

Another construction for egg-shaped figures provided circle FKB touches circle ABC at B. (Fig. 9.)

Paragraph 8. The larger the circle DFG (Fig. 8), the smaller will be angle at F, and the more indistinct will become the intersection point at F with line AF. In this case the following construction may be found preferable.

In Fig. 9, circles ABC and FBK, touching at B, are given.

Find tangent point F and center E of circle AF. Make $AG=BG=R$. From G as a center with radius R describe circle ABH, and F will be the required tangent point. From F draw FI and prolong to E, then $FE=AE=R_1$ and E will be the center of the circumscribed circle AF.

Proof: Draw dotted lines GF, GI and GE, then the triangles GBI and GFI are equal as all their respective sides are equal.

$\therefore \angle a=90°$ also

The triangle AEG = the triangle FGE because

$\angle$ at $A=90°=a$ and $AG=GF$ and hypothenuse GE is common.

$\therefore AE=EF$.

Corollary: Arc BH is the locus for all tangents to Radii R_1 at the intersection point F of circle FBK for Radii r; the limit of r being between zero and R.

Paragraph 9. Computation of R_1:—

$OE^2+OI^2=EI^2$ or

$(R_1-R)^2+(R+r)^2=(R_1-r)^2$ squaring and reducing we have

$R^2-R_1R+Rr=-R_1r$ and

$R^2+Rr=R_1R-R_1r$ and

$R_1(R-r)=R(R+r)$, whence

$R_1=\frac{R(R+r)}{R-r}$ being the same equation as computed in paragraph 7.

Of course there is no necessity for the two circles to touch at "B," this being only the general rule for egg-shaped sewers, as any two circles may be connected by circumscribed circles, by using the method indicated in Fig. 1; but where the accurate position of center E is required, the radius of the circumscribing circle may be easily found by introducing respective values in equation 7. For instance: A new egg-shaped sewer has been introduced for use, when the ordinary flow of liquid is very small, by making the conjugate diameter $= 3R$ and $r=\frac{1}{4}R$. (See Fig. 9a.)

By making $d=R$=the distance from the given point A, to center of the second given circle, and $h=3R-R-\frac{1}{4}R=1\frac{3}{4}R$, and introducing these values in Equation 7, it will be found that $R=2\,2\text{-}3R$.

R. von Ezdorf.

Fig 8

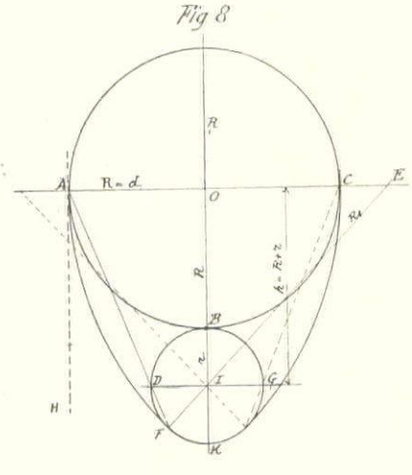


Fig 9

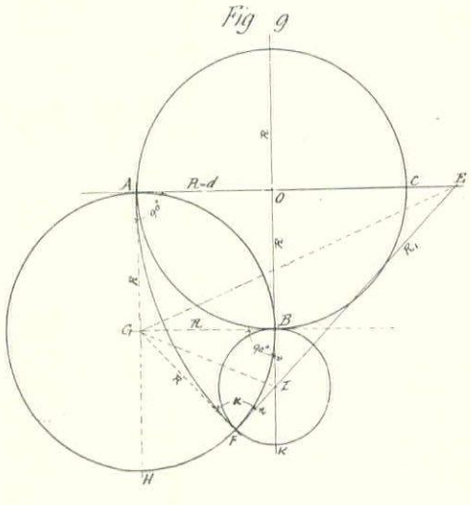
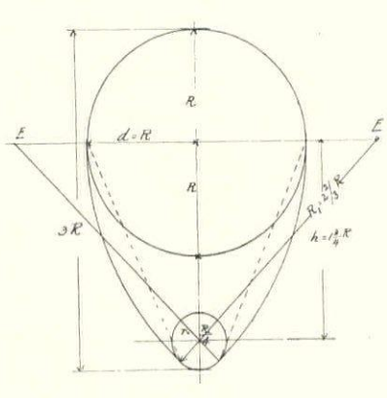


Fig. 9a



FIRE-RESISTANCE OF BUILDINGS CONSTRUCTED WITH REINFORCED-CONCRETE.[1]

ALL practical fire-fighters will, in view of their own experiences, unanimously agree that the fullest success in fire-fighting can only be secured by vigorous attacks at close quarters inside the burning building. Unless in some measure such close attacks on the discovery of a fire can be made with ample volume of water at efficient pressure, the building involved, especially if of large extent, will probably with its contents be destroyed, and the prevention of the spread of fire to the surrounding property may become both difficult and dangerous. Buildings erected to meet these requirements have lamentably failed under the test of actual fires, chiefly owing to non-compliance with conditions obviously necessary to secure success.

To avoid such disasters, buildings effectually separated into compartments of moderate extent, planned without unprotected floor openings, and constructed so as to give ready and secure access for firemen to every part, for the longest period of time possible after an outbreak of fire, are required both in the interest of the public and of the chief officers of fire-brigades and salvage-corps and the men under their command. Buildings constructed with reinforced-concrete, properly prepared with suitable aggregates, sand and cement, ample thickness of such concrete being continued in front of all metal rods or network, will satisfactorily meet these requirements if the conditions as to extent and other provisions referred to are duly observed.

Experience has repeatedly proved that large buildings constructed with incombustible materials only, but without due protection against the inevitable action of heat, fire, and water on the metal and other materials used, although called "fireproof," are during the burning of their contents of a most treacherous and dangerous character, defying all reliable calculations as to the time and manner of their certain collapse. Responsible officers therefore very properly hesitate to send men into or even close to such buildings after any portion may be well alight, and frequently structures of this nature are unavoidably left to their fate.

Why architects and engineers continue to waste their clients' money on the erection of dangerous buildings of this character and proclaim them "fireproof" is a mystery which firemen fail to comprehend. It cannot be too strongly asserted that it is false economy of the worst description to omit efficient protection against the action of fire for all structural metal work used in important warehouse and factory buildings.

In view of the experience referred to in the case of buildings constructed with unprotected metal columns and girders, the use of timber in posts and beams of large scantling with thick plank floors, made air and water tight, has been extensively employed with considerable advantage, especially where protected with an efficient system of automatic sprinklers; further advantage would be secured if the timber used is made thoroughly and permanently flameproof, but effective processes with this object appear at present to be too costly for general use.

The term "reinforced-concrete" is used to describe systems of construction in which iron or steel, in the forms of rods, bars, or network, is embedded in concrete, both horizontally and vertically, so as to take all tensional strain and offer resistance to shear, leaving the concrete to resist compression, thus uniting both materials so that each is applied to the best advantage.

Previous methods of fire-resisting and slow-burning construction, especially for warehouses, trade, and manufacturing premises, are now rapidly giving place to reinforced-concrete systems, used either alone or in combination with hollow reinforced-concrete or porous terra-cotta blocks. These systems, it is hoped, will enable architects and engineers to meet conditions necessary to obtain resistance to fire.

Reinforced-concrete is claimed by its advocates to be a safe structural material, but this can only be conceded so long as normal conditions continue, which many users of these new structural methods appear to consider will always be the case, and therefore make no provision against possible if not probable changes resulting from fire amongst the goods stored in buildings of this construction.

The materials employed in reinforced-concrete acquire no new fire-resisting qualities, and although they may be made effectively to assist each other in this respect and offer every facility for providing building of the character needed in the interest of the public and of firemen before mentioned, it is necessary, to secure such qualities, duly to consider and provide against the effect of heat, fire, and water on the materials employed, using only materials and methods proved from actual experience under various known conditions to be effective. This is equally necessary with reinforced-concrete systems as with other methods of construction, if satisfactory resistance to fire is expected, and the avoidance of disasters that have occurred with other systems desired.

The City of New York Building Code, 1901, provides that all systems of floor construction used in buildings required to be "fireproof" shall be submitted to an official test for four hours under a distributed load of 150 lbs. per sq. ft. placed on bays 4 ft. wide between steel beams 10 in. deep, weighing 25 lbs. per ft. run, having a clear span of 14 ft., these beams being protected in the manner adopted by the system under test, the temperature to average not less than 1,700 deg. Fahr. for the whole period of the test. At the end of this four hours' heat test a stream of water through 1⅛-in. nozzle under 60 lb. pressure to be applied to the under side of the floor for five minutes; the top of floor to be then flooded with water under low pressure, and the stream from the 1⅛-in. nozzle under 60 lbs. pressure again applied to the under side of the floor for a further five minutes.

A load of 600 lbs. per sq. ft. to be then placed between the beams equally distributed.

If during these tests any flame has passed or any part of the load has fallen through, or if the maximum deflection of the beams, having a clear span of 14 ft., exceeds 2½ in., the use of the system is prohibited in any building required to be "fireproof." Similar test regulations are also applied to partitions.

The materials used, the method of application and workmanship employed in the structure under test, constitute the standard for the system when used in actual building.

The American National Board of Fire Underwriters, in their carefully considered Building Code, recommend that the thickness of protecting concrete for all important metal members in columns and beams of reinforced-concrete should be not less than 4 in.

The Fire Offices Committee of the United Kingdom require that for "standard fire-resisting buildings" constructed with reinforced-concrete the aggregates and Portland cement used shall be of the special character defined, with a thickness of not less than 2 in. in front of all important metal members of columns and beams.

These requirements are the minimum that can be adopted with reasonable prospect of avoiding collapse in case of a serious fire amongst combustible goods stored in large buildings.

Hitherto architects and engineers who devote themselves to reinforced construction appear to be so confident of the strength and stability of this new structural material under all conditions that they fail to give reasonable attention to the fire-resisting qualities of the materials they use, being quite content to declare that steel rods embedded in concrete must be more fire-resisting than any other combination of materials.

Published examples of the action of reinforced-concrete under actual fire fail to give definite particulars with regard to the diameter of the reinforcing rods, the composition of the concrete used, and its thickness in front of metal members. Information as to the nature of the fire and its extent, where extinguishing appliances are brought to bear, with the power of these appliances and water supply available, are also usually of the vaguest description or altogether absent.

Any photographs submitted by interested parties illustrating the effect of the fire will doubtless be taken from points of view most favorable to the object the photographer desires to serve. Sometimes such photographs do not even illustrate the portions of the building affected by fire, but only parts damaged from some other cause, such as explosion or shock, having no bearing whatever on questions of fire-resistance.

Experts in reinforced-concrete buildings agree that to obtain the best results (considered only from a structural point of view and under normal conditions), reinforcing rods must be placed near the outer surface of the concrete, a thickness of one inch in front of the rods being generally adopted; but this thickness is altogether insufficient for the protection of metal rods against a serious fire, and the aggregates, sand and cement, for the concrete used to protect the metal rods are of the greatest importance.

It has been conclusively proved that concrete having gravel aggregates is especially unreliable under the action of fire, and the same may be said of other dense material. Aggregates that have passed through fire and are of a porous nature, such as broken stock brick, clinkers, clean coke-breeze with fine-ground.

[1] A paper read by Mr. James Sheppard, A.I.E.E. (Chairman, International Fire Library, Member of Executive of British Fire Prevention Committee), at the Milan International Fire Congress, 1906.

high-class Portland cement and sand, offer the greatest resistance to fire; but even with these materials a thickness of at least two inches in front of all important metal members is essential for reasonable security.

There would be no difficulty in applying a thickness of two inches of concrete of this description for the protection of all metal work, while the central portion of the concrete might be of different material.

It is to be feared that some of the large buildings already erected with reinforced-concrete will fail when subjected to a serious fire amongst their inflammable contents, especially in cases where the building chiefly consists of extensive galleries round large central vertical spaces passing through all floors; such buildings certainly involve the possibility of very serious consequences, as proved in numerous instances, and even reinforced-concrete construction can do but little to lessen this evil. The Horne Building, Pittsburgh, is a case in point.

The method adopted for protecting columns and other parts of reinforced-concrete structures against mechanical injury during the making and deposit of merchandise is of the greatest importance. With this object, in many large public warehouses constructed in reinforced-concrete steel angles of considerable size and weight are partly embedded in the concrete flush with its outer face at each corner of numerous square columns supporting very heavy loads; these steel angles are held in place by riveted eyes passing into the concrete. In the event of a serious fire amongst merchandise stored round these columns these steel angles would twist, displacing portions of the concrete, leaving important reinforcing rods exposed at most critical moments. Any mechanical protection needed should be held in position independently of the concrete and be placed against its outer face only.

Divisional walls relied upon as fire-stops in warehouses and similar buildings should not be less than nine inches thick.

In a fire-test made in a reinforced-concrete box on thick walls enclosing about 175 cubic feet, moisture was freely driven through the sides of the box, two of which were six inches thick and two four inches thick. The evaporation of this moisture kept the outer side of the concrete cool, but on the passage of moisture ceasing, which it did at the end of the test of forty-five minutes' duration, the outer surface of the concrete became very hot.

Combustible goods against a reinforced-concrete wall less than nine inches thick would be liable to ignition by heat from a fire burning on the opposite side of the wall.

With the kind permission of the executive of the British Fire-Prevention Committee, I am glad to be able to give a few photographic lantern views showing results following test with different classes of concrete and metal construction, in which all conditions are definitely recorded.

As you are all aware, the Fire-Prevention Committee's tests are conducted under the Universal Standards of 1903, which require for classification, as affording "full protection" against fire, a fire test of four hours' duration (attaining 1,800 deg. Fahr.), followed by the application of water for five minutes from steam fire-engine to a floor measuring at least 200 ft. super., loaded with at least 2½ cwt. per ft. super.; whilst other classifications are obtainable, such as that of affording "partial protection" and "temporary protection" for lesser periods and under less stringent conditions.

According to these standards it will be observed how few of the examples I am presenting have obtained the highest classification, and it will also be observed that some of the examples presented are entire failures.

THE WAY THE PUBLIC ENCOURAGES SCAMPING.

IN bringing a series of articles on "bungalows" to a close, says as briefly as possible the distinguishing features of these *The Building News*, it may be of advantage to recapitulate buildings, and to lay down for the guidance of builders some general rules which may save them considerable trouble and expense in the erection of houses of this kind. It must not be forgotten that the mode of construction adopted will depend a good deal on whether the house is being erected by an owner for his own residence, or by a builder as a speculation; in the former case the work will, no doubt, be of the best kind; in the latter it will probably be not quite so substantial, though it may be more attractive to the eye. It is, unfortunately, only too true that if one is to build to make a profit, or, in other words, to make a living by speculative building, it is absolutely certain that scamped work will pay much better than that which is substantially done; and the man who puts out his best endeavors to build well—that is, honestly—will find an unappreciative public, and his way to the bankruptcy court, for the public do not know good work from bad, and they are wholly sceptical as to any builder supplying the former. To build to make a profit, then, it is necessary to "scamp" the work; but this must be done judiciously. In a provincial town an architect who had unlimited faith in the public and a very limited experience of them in such matters, determined to build as well as he knew how to do it, feeling certain that good work would be appreciated, and that a house built on such lines would be eagerly sought after at a price which would leave a margin of profit. He unbosomed himself to a builder who had a building plot exactly opposite in the same road, and the latter agreed to build a house to the same plans and elevations, reserving to himself the right to build it in the approved speculating style. The builder asserted that he would dispose of his building more rapidly than the architect would dispose of the other, and he ventured to wager that the architect would not get a penny more for his house in the end for all its good points. So the competition started. The builder dug out his cellars and screened a lot of garden soil and clayey sand for mortar-making; road scrapings added from time to time made, with a little lime, good brick and plastering mortar. It had the advantage, at least, of being sticky. The architect, who always specified good, clean, sharp sand, was disgusted with the builder's compound, and he had river sand carted four miles; this, mixed with ground lias lime, made all his brick mortar; that for the plastering was Portland cement and sand, the finishing coat being Parian. The bricks in both houses were the same in every respect; but the bricklayers had a habit of building without a due regard to line or plumb rule, and the result was a bulging of piers and jambs which was rectified by hammering the offending work back into its place by hitting it with a brick "end on." When the architect saw this he had the work taken down and rebuilt, thus adding to the expense. The cheap house was covered with thin Welsh slates on battens, the other with Westmoreland green slates on boards and felt; the floors in the former were laid in the usual way, and in the latter they were herring-bone strutted and pugged, the flooring-boards being cut from White Sea battens, 7 by 3 inches (a flat and a deep cut only in each batten); the joints were all rebated. Embossed glass was fixed in the lower sashes of all the bedrooms, to save window-blinds, as these necessitated constant washing, and the whole of the glazing, back and front, was done with plate-glass, one-fourth of an inch thick. Linoleum and other waterproof mats are usually hung on the walls behind washing-stands and lavatories. Here the wall spaces were paneled with tiles where these articles of furniture might be placed. Speaking-tubes were fixed from the dining-room to the kitchen, and every contrivance was adopted to make the house a permanent structure, and its arrangements of the utmost convenience. Both houses were finished—one at a cost of £1,200, and the other at a little over £1,500—but this difference in cost was wholly lost, for not one penny more, either for rent or sale value, could be obtained for the best house beyond that offered for the other. The builder's house let at once, and it was even sold before a tenant could be obtained for the other. Finally the latter found a purchaser at £1,100, or £400 less than its cost; and the architect paid rather dearly for the experience he gained in speculative building.

THE REVIVAL OF SCULPTURE.[1]

THERE is, nevertheless, a bright side to the immediate future of the arts which are represented at Burlington House There is even a bright side to the present Academy exhibition. It is clear that we are going to have a revival of sculpture. This development has been in the air for some years past. The very presence in the world of such a great sculptor as Rodin has something to do with it. He has given the art a new impetus. He has shown afresh what the sculptor can do. He has made us more impatient of all that is heavy, formal, dull. He has proved that the clay, when it is handled by a man of genius and temperament, and warm emotions and vivid imagination, can be made to stir our feelings deeply. Rodin, in short, possesses just what the painters of our time lack—ideas. He models his clay with brains, and he has set on a number of his fellow sculptors to strive after putting individuality into their work instead of letting it be swamped by convention and routine.

Of the low condition to which sculpture fell in England during the eighteenth century, and in which it remained until a few years ago, we need no further evidence than the evidence of our

[1]Extracts from a paper by Mr. H. Hamilton Fyfe in "The Nineteenth Century."

eyes. As we walk about London, our vision is constantly assailed by monstrosities in stone or marble or bronze, which would be incredible did they not exist. There are, it seems to me, only three pieces of sculpture in the whole of London which can be looked at with any pleasurable emotion, which convey any emotion at all, except a sense of immeasurable depression and disgust. These are:

(1) The King Charles the First statue at the top of Whitehall, a work of rare beauty and distinction. Let us be grateful to the old fellow who, when the Commonwealth Parliament ordered it to be destroyed, buried it safely in his garden and sent the Vandals a cartload of scrap iron!

(2) The Carlyle statue in the Chelsea Embankment garden, by Sir Edgar Boehm, a noble memorial of the rugged thinker who lived close by, catching the very character of him as surely as the Whistler portrait did.

(3) The memorial to Sir Arthur Sullivan in the Victoria Embankment garden close to the Savoy Theatre, by Mr. Goscombe John. Difficult as it was to deal with Sullivan's undistinguished features, his scrubby moustache and disfiguring side whiskers, Mr. John seems to me to have treated his subject with the happiest ingenuity. The eye is taken by the graceful form of the woman who leans her head on her arm against the pedestal in an attitude of utter abandonment to grief. The small bust of the musician is hardly noticeable except as an integral portion of the design.

It is typical of the British attitude toward the seemly and the beautiful, that a complaint was lodged against the artist, at the time of the unveiling of this work of unusual merit and charm, for not having made Sullivan more prominent. The complainants would, no doubt, have liked a trousered, frock-coated, standing figure like that grotesque one of Brunel which affronts the eye near at hand; or possibly a seated effigy after the fashion of the statue, also not far off, of John Stuart Mill, who seems to be rising hastily after taking his seat, exclaiming with some (pardonable) annoyance that he had encountered the business end of a nail. Some day we shall break up all these ugly, stiff, ungainly figures which bear witness to the evil fortunes upon which the art of sculpture once fell in our country. We have begun to see what message sculpture should bring to us—a message of pleasure, of emotion, of joy. We have begun to understand that it ought to show us, not how hideous the human form can be made by modern clothing, but how beautiful are its lines, how exquisite its proportions, when it is unspoilt. We are looking now to the sculptor to quicken our powers of imagination. People who have in their houses, as so many do now, casts of the wonderful works of classical times, or even those pleasant little bronzes of modern workmanship which abound in Munich, Vienna, and Paris, will not put up for ever with the Albert Memorial.

To estimate the distance which separates us from the mid-Victorian period, compare the noble, tender, and dignified "Memorial to the Men who fell in the Boer War," by Mr. Nicholson Babb, in the central hall at Burlington House, with the grotesque Guards' Memorial erected after the Crimean War at the bottom of Waterloo Place. The latter tells us nothing. It gives us no feeling, except a feeling that we should like to leave the spot as rapidly as possible. Mr. Babb's group, on the other hand, is obviously the work of a man who has felt his subject, and is skilful enough technically to make us feel it too. The angel is really impressive; its wings are treated with exceptional ingenuity and sense of style. The wounded soldier could scarcely be improved upon in any respect. His attitude of utter weariness and exhaustion is moving, and intensely human. Yet one can trace, too, the sculptor's assurance that he is dying in a good cause, and is glad to die. The people of Grahamstown, South Africa, are to be envied this fine adornment to their town. We have in London no memorial of its nature which could for a moment compete with it.

Close by Mr. Babb's group is a belated specimen of the kind of sculpture which passed muster with the mid-Victorians. I have always heard that Lucknow is an unpleasant place, in the hot weather especially, but surely it has done nothing bad enough to merit the erection in one of its public places of this comical effigy of Sir John Woodburn, late Lieutenant-Governor of Bengal. It would be funny anywhere. It is difficult, indeed, when we notice that it is by the man who designed and executed the Sullivan monument (of which I have already spoken) not to believe that it is an intentional joke. This, however, would be doing Mr. John an injustice. He has merely done what he knew was expected of him. It is because sculptors are ceasing to follow this line that sculpture is looking up. Any appeal to emotion in place of meaningless adherence to tradition is bound to be attacked, as Rodin's "Balzac" was. Rodin took no notice. Against whom is the laugh now? Against the bumble-headed pedants who attacked him. Mr. John should flout convention and be himself. The sort of statue he has made of Sir John Woodburn should be left to marble-masons to execute and to sorrowing relatives to erect in cemeteries. It is as little in place in an art exhibition as a wreath of immortelles under a glass cover would be at a flower-show.

Of the quieter pieces in the central hall there is nothing more satisfactory than Mr. Albert Toft's small group of his children. It is an excellent idea to have children modeled instead of painted. The result in most cases would be more decorative; and of children especially, the charm and the character can be expressed far more effectively in clay than on canvas. Such a work as this of Mr. Toft's would lend distinction to any room. One of the difficulties connected with sculpture is that people will not buy it, because they do not know what to do with it. The atmosphere of our climate makes it impossible to keep statuary in the gardens, and except in a very large house there is no room for the large groups which most sculptors go in for. Mr. Toft's entirely successful experiment clears that difficulty out of the way.

HATSHEPSU.

ONE of the greatest works of archæological exploration of recent years is that which the Egypt Exploration Fund has been for more than ten years engaged upon—the clearing and partial restoration of the great Temple of Amen and Hathor, at Dier-el-Bahari, near Thebes. It has been a most expensive work, having cost more than £10,000, but the results have been, both from an historical and artistic point of view, of the greatest importance. The work has from the commencement been under the direction of Professor Edouard Naville, who during the last three seasons has had the assistance of that able Egyptologist, H. R. Hall, of the Egyptian Department of the British Museum. There were two temples at Dier-el-Bahari—the older the funeral temple of King Mentuhetep III, of the twelfth dynasty, about B.C. 2500; the later the splendid fane erected by the great Queen Hatshepsu, about B.C. 1500. This later temple is the one on which so much time and money have been expended. But the outlay has not been wasted, for we have restored to us the memorials of the life and deeds of one of the most remarkable women the Orient has ever produced, and one who from her resemblance in mental capacity and enterprise to our own Virgin Queen may be fitly styled the Elizabeth of Egypt.

The daughter of Thothmes I by his beautiful wife, Queen Aahmes, she was early associated with her father, and on the walls of the birth chamber of the temple we see the scenes representing her birth as a divine incarnation of her father, Amen-Ra—all monarch of the great Theban dynasties being supposed to be children of Amen. On another wall is depicted the ceremony of her coronation as king, for she assumed male attire, even a false beard, and used all the kingly titles in her inscriptions. One very important series of sculptures is that which represents the return of the great naval expedition which she sent to the incense-producing land of Punt (probably Somaliland), which, under Nashi, her admiral, the Raleigh of the period, returned laden with rich treasure and strange animals, birds, and plants. The new volume of the exploration, which has just been issued by the Exploration Fund, contains some very interesting matter, for it relates to the shrine of Amen-Ra and the forecourt, all of which were richly decorated with sculptures. The shrine, which consists of two rooms, was entered by a lofty granite doorway, and on either side of the door are representations of the man-queen, wearing the crowns of Upper and Lower Egypt. A specially interesting scene here represents the Queen being brought before Amen, and the god Thoth, or Hermes, acts as priest, and introduces her with a curious address:

"She salutes thee, she speaks (to thee). She cools thee with water, she gives thee incense. The double is satisfied when she fumigates thee with the eye of thy own body, her incense. O Amen, lord of the throes of the two lands, when thou resteth in thy abode, where thy beauties are worshiped, grant her life, strength, and happiness."

Such is the threshold prayer. The shrine no doubt contained the two sacred boats of the morning and evening, boats in which he sailed across the sky. In the inner and dark shrine chamber was the splendid shrine of ebony, in which the statue of the god was kept. A portion of this shrine was discovered in 1894 by M. Naville, and it is most interesting to mention the artist who made it. Indeed, in Egypt, unlike other lands except Greece, the

names of artists of great works are known and handed down. In regard to this great temple we know that the architect was a man named Senmut, who, in addition to his artistic abilities was a minister of state, "chancellor" and "bearer of the royal seal." He it was who built this and many other temples for his royal mistress. The work of decoration was given to a man named Tehuti, the record of whose life is found on a stele discovered by the Marchioness of Northampton. He was the Benvenuto Cellini of the age. He it was who made the splendid ebony shrine of Amen-Ra, "King of the Gods," who "plated the doors of the temple with bronze and electron," who made crowns, necklaces and jewels for the Queen. These facts give a living interest to these discoveries, for they are, indeed, the work of the oldest masters. Another interesting series of sculptures, the work, designed, no doubt, by one of those artists, represents the Queen making offerings to the shades of her father and mother, and the portrait of the latter is a beautiful piece of work. Particularly interesting as showing this school of realism in Egypt is a series of sculptures, slabs, representing the gardens of the temple. Here we see ponds lined with shady trees, or bordered with lotus plants, and full of fish. Here we see a duck rising with a fish in his mouth, or resting on one leg and scratching his poll with the other. A fish nibbles at a lotus tree which touches the water, or a flock of flamingoes fly frightened away from a reed brake. Such is the art of which this remarkable Queen was the patroness, and Tehuti and Senmut her artists craftsmen, which has been rescued from destruction by the Egypt Exploration Fund.—*London Globe.*

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RENAISSANCE CAPITALS: PLATES 65-72.

MONUMENT TO GENERAL W. T. SHERMAN, WASHINGTON, D. C.
THE LATE CARL ROHL-SMITH, SCULPTOR.

EQUESTRIAN MONUMENTS, WASHINGTON, D. C.: "GEN. J. A. LOGAN," MR. FRANKLIN SIMMONS, SCULPTOR; THE LATE R. M. HUNT, ARCHITECT. "GEN. W. S. HANCOCK," MR. H. J. ELLICOTT, SCULPTOR; MESSRS. A. B. MULLET & CO., ARCHITECTS.

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Additional Illustrations in the International Edition.

MONUMENT TO GENERAL JOHN A. LOGAN, WASHINGTON, D. C. MR. FRANKLIN SIMMONS, SCULPTOR: THE LATE RICHARD M. HUNT, ARCHITECT.

NOTES AND CLIPPINGS

GUIDE BOOKS SEIZED IN TURKEY.—Consul Thomas H. Norton writes from Smyrna concerning the difficulties attending the admission of guide books into Turkey, and states that they are seized by the customs officials. He says: "The officials at Turkish ports of entry are instructed to take possession of all guide books bearing upon Turkey or any portion of the empire when found in the baggage of persons arriving from abroad. Such seizures are forwarded at once to the Director-General of the Customs at Constantinople, from whom they may be secured by the diplomatic representative of the country to which the persons in question belong, on furnishing proper guarantees or on promising to send the prohibited volumes outside the Empire. Frequently guide books for countries other than Turkey are regarded as falling under the ban and are likewise retained."—*U. S. Consular Reports.*

THE SEA DISGORGING ITS SPOIL.—The great work of resuscitating San Francisco has obscured another remarkable American exploit, which is rapidly approaching completion. This is the salvage of Galveston, which flourishing port was swamped by the sea in 1900. Since that time a great sea-wall over four and a third miles in length has been built completely round the front of the town, facing the Gulf of Mexico. It is seventeen feet high and sixteen feet thick at the base, and five feet across at the top, being substantially protected from undermining by an "apron" of stone and sheet-piling. But perhaps the most interesting part of the work of reconstructing the town is the raising of the protected district. This huge enterprise, reports the British Consul in April, is about a quarter completed, and the details afford every evidence of American ingenuity. A feature of the scheme is to bring sand from the gulf itself, and to pump it through pipes on to the land. This is making the sea disgorge its spoil "with a vengeance."—*London Chronicle.*

A CURIOUS JAPANESE CUSTOM.—There is a curious old law in Japan, still in effect, that when the Emperor or Empress appears in public no private person must occupy a higher place than the member of the royal family. On such occasions, therefore, it is the custom to close the shutters of all the upper stories of the houses past which the royal party goes.

THE SITE VALUE OF ALL HALLOWS' CHURCH.—How many of our readers are aware that there is, within easy distance of the window behind which these lines are written, a church whose site is well worth £800,000? This sum, says a writer in the July number of the *Sunday Strand,* is sufficient to build and endow forty churches, and provide for the spiritual requirements of a town as large as Derby or Brighton. The church referred to is that of All Hallows, in Lombard street, City, known to every architect as one of "Wren's churches." What makes the anomaly more glaring is the fact that the population of All Hallows' parish does not number 300, with an average congregation of twenty-six.—*London Chronicle.*

THE KAISER AND HEIDELBERG CASTLE.—All Germany is now excited over the condition of the Heidelberg Castle. For two years the question whether the "Otto Heinrich" portion of it—the handsomest section—shall or shall not be taken down and rebuilt has aroused all Baden to the point where fraternal warfare seemed close at hand. Now the matter has lost its local significance and become an imperial issue. The newspapers everywhere have taken sides for or against. Expert after expert has been consulted, and one commission of architects after the other has had its say only to be overruled or controverted. So serious has the situation become that there is no little danger of the structure's tumbling down before a decision can be reached. This is precisely what one party wants; but even the elements and time must not do their work without official sanction. Hence there has been an appeal to the highest tribunal. Everybody knows that the Kaiser is a great architect; is he not a world-renowned poet, musician, orator, general, designer of battleships, as well? In August, therefore, the head of the state is to settle the disputed point.—*New York Evening Post.*

ENGLISH LAWS ON SMOKE PREVENTION.—In the year 1396 one John Blank (a cousin of the American "John Doe") was tried, condemned and executed, for burning coal in the city of London. That law, however, appears to have fallen into innocuous desuetude, for at the present time the emission of smoke from chimneys may be dealt with throughout England, where that emission is a nuisance, at the common law, or where that emission offends against the Public Health Act of 1891, or against similar provisions under local acts. To constitute a nuisance at common law there must exist injury to health or property or discomfort to individuals. Where an individual has sustained, or is about to sustain, an injury, he may invoke the law by bringing an injunction or he may recover compensation for damages already incurred. It is not necessary to show that any particular kind of smoke has been emitted, or whether it comes from a factory or a private dwelling. The material question is, in all cases, whether the annoyance produced is such as materially interferes with the ordinary comfort of human existence. Under the Public Health act means are provided for dealing summarily with the nuisance of emitting black smoke from a factory chimney. Among the local acts, that of the town of Nottingham seems simple and perfect; it simply provides that if any fireplace or furnace is so constructed as to prevent the burning of smoke, that the owner shall be fined and that any fireman negligently using any furnace so as to produce smoke shall also be fined. There is a concerted movement on the part of the Smoke Prevention Society and the Sanitary Institute to have the smoke laws revised and consolidated, but a return to the provisions of the fourteenth century laws is improbable.—*Municipal Journal and Engineer.*

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MESSRS. HORGAN & SLATTERY have called our attention to the fact that, in following the newspaper abstracts of the decision rendered in the case of the City of New York's appeal against an award in the architects' favor, we were beguiled into making an unintentional mistatement. Although, as we said, the court sustained the City's appeal, it did not, as we mistakenly asserted, deny the architects' contention that they ought to be accorded a new trial. We regret sincerely having blundered, as it seems to be peculiarly difficult in the case of an erroneous legal statement to associate the correction with the original error with the complete intimacy desirable. It is very unfortunate that this case, which is really an important one, cannot be dissociated from its semi-political concomitants, the disagreeable effect of which is that a mere narration of the history of the case seems to give ground for the assumption that it is referred to because of political motives of one kind or another. As we say, the case is of real importance and we are glad the respondents have furnished us with the full text of the decision which may be found elsewhere in this issue.

THE real point of professional interest is the determining what is "substantial performance" of the obligations an architect assumes when he undertakes to design a building that can be erected at a stated outlay. Mr. Justice Houghton, in the opinion adopted by the majority of the court, gives an admirable statement of the "proper and salutary rule," as he expresses it, that applies to such professional obligation resting upon the architect. "An architect," says the opinion, "employed to furnish plans and specifications for the erection of a building is entitled to remuneration therefor, if they are made in accordance with the directions of the owner. He cannot recover, however, when the owner stipulates that the plans and specifications shall be for a building not to cost over a specified amount, if the plans and specifications made are for a building substantially exceeding that sum." It is unfortunate that it is not legally determined by how large a percentage the builder's estimate may exceed the owner's limit of cost and yet leave the architect in the position of having accomplished that substantial performance of his contract with his client upon which alone rests his right to receive compensation for the labor he has expended. In the case at bar, the court merely determines that "if there was a limitation within which the plaintiff must reasonably come, and within which it was bound to come, the excess cost [nearly fifty per cent.] was so great that it cannot be said that plaintiff substantially performed its contract."

THE same opinion makes another declaration that is of importance to architects and incidentally shows that we had not good ground for intimating, as we did a week or two ago, that a direct selection of an architect, such as that of Mr. Almirall to design the Brooklyn Public Library, might actually be found to be illegal because of certain provisions in the city charter. Apparently the city's solicitors advanced this claim, only to have it denied by Mr. Justice Houghton in these words: "It was not necessary to let the contract for the preparation of plans and specifications for the proposed armory by competitive bidding. The services required scientific knowledge and skill, and that character of service need not be obtained by bids." The acknowledgment from the bench that the practice of architecture requires "scientific knowledge and skill" is as gratifying as it is unusual and induces us to hope that the writer of the opinion may have occasion to write many of the court's opinions in later building cases.

THE desirability of establishing national litoral reservations, to which we referred some months ago, is emphasized by an incident which occurred last week at Oyster Bay, Long Island, a place that enjoys a temporary notoriety as being the summer home of the country's present chief executive. Acting through its properly elected officials, the town caused to be torn down sundry walls and piers which had been built by certain wealthy summer residents, on the theory that their riparian rights extended down to low-water mark, across a public road which skirted high-water mark. The road is rather a right-of-way than a properly built and well maintained road, but such as it is it seems to be secured to the citizens of the town by deed and covenant of a very respectable antiquity. Nevertheless the wealthy owners who are said to be encroachers on public property propose to fight the case.

IT is now plain that the energetic but too often ill-advised District-Attorney for Boston has found he has made another of his spectacular blunders in accusing of fraud in the matter of using cement the sub-contractor who is doing the concrete-work for the Girls' Latin and Normal School buildings in Boston. A careful count of all the cement lying unused at the job, made in the

Entered at the Post-Office at New York as second-class matter.

presence of the various parties interested, disclosed the interesting fact that there was just one-seventh as many bags of cement unused as the District-Attorney in his public letter to the Mayor declared that there were! A careful inspection of the work done by the contractor did not disclose that there was anything amiss with it, but, in spite of this, careful and comprehensive tests were made. The tests, conducted at the Watertown Arsenal, showed that the concrete was properly and honestly prepared and of rather unusual strength, showing a factor-of-safety of five or six at the time the tests were made. Meanwhile the District-Attorney had discovered that the same sub-contractor has been using crushed "pudding-stone" as an aggregate in place of the "trap rock" called for by the specifications, and consequently he publicly admonished the Mayor that the difference in cost of pudding-stone and trap rock should be withheld from the sub-contractor in settling his account. On this point, too, the experts report that the substitution had been made with the approval of the architects and was allowable.

WE are disposed to hold it rather a misfortune that the result of a friendly suit between the regents of the Smithsonian Institution and the executor of the will of the late Harriet Lane Johnston has been a decision by the Supreme Court of the District of Columbia that the Smithsonian Institution is "a national gallery of art." For the purpose in hand, the determining whether the Institution may lawfully be made the custodian of Mrs. Johnston's collection of paintings, and for similar "purposes of bequest," perhaps the opinion will do no harm. But we feel strongly that a National Gallery, whenever established, should be absolutely free of all entangling alliances and be in no way dependent upon the restrictions devised by the excellent son of the Duke of Northumberland. Further, we feel as emphatically sure that the first article in the regulations of such National Gallery should assure forever to the directors the right to exhibit permanently or temporarily, to withdraw from exhibition temporarily or permanently, to separate, reclassify, correct ascriptions and have absolute power and freedom—short of sale for profit—in dealing with all or any part of every example of art that may by devise, gift or purchase come into the possession of the National Government. The second article should bar with equal positiveness gifts and bequests that are conditioned on housing in separate rooms, as in the Johnston case, or in special pavilions, as in the Freer case.

PERHAPS one reason why the exhibitions of the T-Square Club, like those of the Pennsylvania Academy of Art, have become so notable is that the managers, having matured their programmes, give themselves ample time in which to carry them out. Barely beyond midsummer and when exhibitors are more likely to be thinking of motor-boats than of stretchers, the T-Square Club announces that in December it will hold its usual annual exhibition. Further than this, it declares that the National Society of Mural Painters, the National Sculpture Society, and the American Society of Landscape Architects will co-operate with it in securing adequate representation of work done in their several fields of endeavor. There will also be a department of Arts and Crafts to which will be admitted the products of the minor arts and handicrafts that properly fall within the classification. With so all-embracing a programme and with ample time for its achievement, the exhibition should be even more than ordinarily interesting.

IT is not often that an architect is made a party to an injunction suit, and it must be rare indeed when the object of the injunction is the restraining of the architect from interfering with the erection of buildings which said architect has designed, and is really desirous of having completed. Mr. Charles M. Anderson, an architect, finds himself in this curious position as regards the erection of two mill-buildings at Towson, Md., the contract cost of which is about one hundred and forty thousand dollars. The builders, Messrs. John Hiltz & Son, are under contract to deliver the buildings complete on October 1, and when, early in June, the union carpenters on the job struck because they were expected to work with non-union hands, the builders promptly declared for the open shop and replaced the strikers with other non-union carpenters. Why this action should have been unsatisfactory to the owners and their architect does not appear: but the latter, acting, presumably, on instructions from his clients, ordered the builders to discharge the non-union workmen and re-employ the strikers. This the builders declined to do, and, to prevent possible interference that would stand in the way of finishing the mills by October 1, sued out a writ of prohibition against the owners and their architect, first filing a bond for five thousand dollars as required by the court.

THE strike of the Stonecutters' Union at the new wing of the New Jersey state-house in Trenton, to which we referred last week, has been compromised and the contractors are free to have the stone dressed at the quarries at the rate of thirty cents per hour in place of having to pay fifty cents to local stonecutters. New Jersey is just now the scene of a variety of efforts on the part of Labor to better its lot. The most curious of these, perhaps, was the strike of the laborers employed on the Hudson County Court-house, in Jersey City, who declared they could not use the wheelbarrows provided by the contractors for the carriage of bricks and mortar, but must use the old-fashioned hod, and struck when the contractors refused to have their work done in so dilatory a way. As the hod-carriers had "affiliations" with other labor-unions they invited these other unionists to "walk out." Finding that their friends were not as staunch as they should be and that the contractors had no trouble in finding plenty of post-graduates in the art of trundling a wheelbarrow who were ready to fill the places they had abandoned, the unfortunate hod-carriers held a meeting, declared the strike off and amended their by-laws, giving it to be understood that hereafter they will be willing to use the barrow on large jobs but that on small jobs the hod must shoulder its way to the front.

REINFORCED-CONCRETE AT THE LONDON CONGRESS.

IN choosing the subject of "Reinforced-Concrete and Its Relation to Fire-Protection," Mr. E. P. Goodrich, M. Am. Soc. C. E., in the paper read by him at the Seventh International Congress of Architects, had in mind the dual conditions necessary to the greatest immunity from fire in large building constructions, particularly where such have varied types of occupancy, together with correspondingly different manufacturing fire-hazards.

The requisites are, first, the employment of the most incombustible materials and the assembling of these elements in such manner as will most effectively limit the spread of fire; secondly, the equipment of the building with such protective and extinguishing apparatus as a wide experience has determined most effective. Either of these essentials alone will accomplish a large measure of results, but to secure a maximum the combination is necessary.

An exemplification of such a combination is the tenant factory community being developed by the Bush Terminal Company, of Brooklyn, N. Y., U. S. A., for which reinforced-concrete has been adopted as the structural part of all buildings. These factories were especially designed to take advantage of all insurance regulations, and thus secure the minimum insurance rates on buildings and contents.

Associations of insurance companies in the United States have had the effect of standardizing requirements. All the most important points thus developed were carefully considered in the design of the Bush factories, which thus were provided with: Special fire-walls, special stair and elevator shafts, waterproof floors, automatic fire-doors, a complete sprinkler equipment, windows of wire-glass in metal frames, etc.

The reinforced-concrete design was prepared with special care as to the fire-resisting qualities of his (Mr. Goodrich's) system of reinforcement, which proved effective and economical, not liable to derangement during construction, and especially advantageous because allowing of the use of special fire-resisting materials at points of greatest danger. The columns, even though built of concrete, were fireproofed with cinder-concrete shells, which served at the same time as a vehicle for the steel reinforcement and as a mould for the construction of the main body of the column.

The building now completed enjoys the lowest rate of fire insurance, both as to structure and contents, accorded any similar risk.

Mr. E. O. Sachs asked to be allowed to make a few remarks on the very valuable paper read. In the first place, he wished to thank Mr. Goodrich for coming over and telling them about one of the biggest buildings in reinforced-concrete erected in the United States recently. In the course of the paper the word "cinder" had been used constantly, and he would like to know the definition of cinder in the United States. Did it come within the term "coke breeze," as used in this country, or was it more used in the definition of "clinker."

Mr. Goodrich said that clinker was the more synonymous word.

Mr. Sachs said that reference had been made to the fact that the fire insurance companies' regulations specified the aggregate which had to be used. They heard constantly of rock and stone aggregates, but they had had experiments showing that clinker aggregates and slag aggregates seemed to have a far higher resistance than these aggregates.

Mr. Goodrich said that the experiments in the United States, as in this country, showed that clinker and coke breeze had a higher resisting point, but the insurance companies thought the rock and stone was equivalent.

Mr. Sachs asked where the aggregate was defined. The fire-office regulations in this country required, he believed, that every part of the aggregate should pass a 1-in. mesh. That was of the utmost importance, as they found in tests and in actual cases of fire that aggregates split and the larger pieces fell off, with the result that the metal became red-hot and the beams deflected.

Mr. Goodrich said the rules did not define the aggregate except that it should be able to pass between the bars, and in no case to be larger than 2 1-2 in.

Mr. Sachs said the object of primary importance, so far as fire-resistance was concerned, was the protection of all metal-work. The metal-work should be protected by a certain number of inches. The number of inches could not be exactly defined by the present state of science, but it would certainly be 2 in. or more. He would say, however, that it was of equal importance on this question of the thickness of the protecting covering that the aggregate should be defined. Further, as safeguards for the actual construction and the additional protection, which could be obtained at practically no expense, was the rounding off of external angles. He offered those three points as being most important ones in relation to fire-protection and reinforced-concrete.

Mr. Max Clarke said he would like to ask the reader of the paper what was the definition of clinker. Mr. Goodrich had told them that this was one of the aggregates which applied, and that cinder was another, but he wanted to get a hard-and-fast definition of clinker. He thought the material to form the aggregate of concrete was one of the subjects which was going to be considered by the Joint Committee on Reinforced-Concrete, and, to him, it appeared that very serious investigation on the point was needed, and it could not be too thorough, as it was now fairly well known, from the experiments conducted by the British Fire Prevention Committee, that light and porous materials were generally the best in case of the outbreak of fire, but not the most satisfactory for strength-giving in construction. For the latter purpose most people would admit that gravel would be used from choice, but it was almost the worst from a fire point of view. Whether some happy combination could be thought of remained to be evolved from the deliberations of those who had the matter in hand, and he would ask the speaker whether such combinations had been worked out at all in America. The Fire Offices Committee in London excepted coke breeze from their list of materials for the aggregate of reinforced-concrete, and he understood the regulations of New York were on the same lines. It was not used as one of the materials, but cinder was. He would like the reader of the paper to give a hard-and-fast definition as to what coke breeze was, and also as to what cinder was, contrasted with clinker. With regard to coke breeze, he knew the Fire Offices Committee objected to it on account of its having a small proportion of unburned coal in it, but, as a matter of fact, they had discovered from experience that unburned coal in the concrete, subjected to 1,800 deg. of heat for three hours, came out just as it was put in, and if any gentleman liked he was at liberty to see the specimens.

Mr. Goodrich said the definitions differed. They tried to exclude materials which were poor. Some engineers allowed soft bituminous-coal ash or clinker to be used. Others required the use only of anthracite material. His personal opinion was that anthracite only should be used. In some cases he had required screening and washing of materials, so as to exclude the fine material which would be nothing more than sand of poor quality, and which would serve to bring the cement into a hard material which would take the place, primarily, of gravel, except that it was more porous. It was almost impossible to exclude unburned coal, and in some cases where tests had been made the unburned coal was 50 per cent. of the clinker, and this was found to be very little affected, except on the surface which was close to the fire. The use of 2 in. or 3 in. of covering was well where it could be done, but it seemed unnecessary in many cases, especially with small material. In any case, the use of a certain amount of unburned coal was almost necessary, and in all probability was not detrimental.

Mr. G. B. Post said it might be of interest to the gentlemen present to know that those in large practice as architects in the United States used ferro-concrete with considerable trepidation, from the fact that there were no established constants which could be employed in computing the strains. They did not know, under different conditions, even what the position of the neutral axis of the beams should be under different loadings. The material itself must be most carefully mixed, and all the ingredients must be perfect, as it was subject to failure. In fact, their opinion of the material was very much like that of the distinguished Mr. Weller with regard to veal pies—they were "werry good things when you knowed the lady as made them." They all looked to the time when they would know more with regard to the subject. Those who were putting up work with enormous rapidity, and who were required constantly to build eight, ten, twelve, or twenty-story buildings in eleven months, were looking forward to the time when they would have more scientific data which would enable them to use the material in a more scientific and less amateurish way. His object in speaking was to say that he had had the honor to be appointed, with Mr. Eames, by the President of the United States a member of an Advisory Board which had been instructed to make extensive tests of all building materials, as well as coal and fuel and various things of that kind. He had urged on the Commission that very careful experi-

[1] As reported in *The Builder*.

ments should be made with regard to reinforced-concrete, so that the same errors would not be found in the calculations with regard to reinforced-concrete which were found in the constants for wood which were determined from experiments and tests carried out on small sections. Fortunately for their country the errors in the loads required by the building laws almost exactly compensated for the deficiency in the constants in the building materials. He did not know whether Congress had made the necessary appropriation for the continuance of these experiments in the last session or not, but if the appropriation had been made he believed that, before the next Congress assembled, America would be able to furnish them with valuable information with regard to the whole subject. There was one other point which was to have most careful and thorough investigation, and that was the question as to whether cement was or was not an efficient protection of steel from corrosion. He had seen steel in small sections in the form of expanded metal used in tabular floor construction which was exposed twelve months to the atmosphere, and which was absolutely destroyed by corrosion. This, of course, might have been an exceptional defect. Another matter not mentioned in the regulations of the Committee which had been brought before them that morning, and which he thought should receive attention, was the danger of electrolysis from the huge free current of electricity in all their great cities.

M. Augustin Rey asked what experiments had been made to show up to what temperature reinforced-concrete was fire-resisting, and he also asked if Mr. Goodrich's system could be employed for industrial buildings several stories in height.

Mr. Goodrich said the question asked was, "To what temperature have the experiments as to the fireproof qualities been pursued?" The actual temperatures found by the use of the melting-point of building materials varied from 1,400 deg. to 2,000 deg. In the Baltimore fire the temperature varied from 1,400 deg. to slightly over 2,000 deg. It was between these limits the tests had been made. He believed that the United States Building Department required that a temperature of 1,800 deg. should be maintained for eight hours. In some cases the temperature was raised and had been maintained at over 2,000 deg., but the usual temperature was from 1,700 deg. to 1,800 deg. Fahr. for several hours. Then the question was asked whether the methods of construction referred to were applied to buildings several stories high, such as working-class dwellings, and so on, and he might say that he had at the present time an office building of eleven stories high, and also several dwellings from three to six stories high, and in San Francisco nearly $1,000,000 worth of work of buildings from one to six stories high.

Mr. A. W. Ruddle (Peterborough) said he had been rather troubled by the statements of the speakers from America. He did not know whether he had made a mistake, but he understood Mr. Goodrich to say that it was unnecessary to use two rods in the reinforcing of steel work.

Mr. Goodrich: Under certain conditions.

Mr. Ruddle said he took it that there was no necessity to obtain any greater external area of the steel, because he understood that the concrete adhered to the steel work, and that the reinforcing in the members which were to give additional strength against tensile strains was given by the adhesion of the concrete to the steel. However, another speaker had raised a point as to whether cement was an adequate protection of steel, and if they coated their steel with any paint they lost at once the adhesion of the concrete to the steel which was to be of so much assistance.

Mr. F. E. Harris (Manchester) said that, having been instrumental in putting up a few ferro-concrete buildings in this country, it had been frequently asked him what were the qualities of the external walls in relation to non-conductibility. This was, of course, a matter which did not largely apply in connection with manufacturing premises, and up to the present ferro-concrete had been mainly used for such buildings only. If they were to use ferro-concrete for any purpose other than manufacturing buildings they would want to know among other things whether the walls were good non-conductors. Their colleagues from America and from the Continent would probably have used armored concrete for domestic buildings, and would perhaps be able to tell them what the qualities of the walls were in this connection. There was one other point which struck him. The walls were all right, and the effect was all right for manufacturing premises. They could get sufficient effect from using armored concrete purely and simply, but if they wanted to get any real architectural effect they wanted something more than they got in manufacturing premises. The only way in which they could seem to get that, so far as he had been able to weigh the matter up at present, was by the wasteful use of the material they had, or, as an alternative, to simply use the armored concrete for the columns and floors. His view at present was that they must simply use armored concrete for walls and floors, for he did not see how they could get any architectural effect such as would be agreeable to clients unless they limited their use of the materials for the purposes he had mentioned. There was a flatness about armored concrete which would be objectionable unless they used an excessive amount of material, which, of course, would not be an economical thing to do. He would personally like to have an expression of opinion from their Continental visitors on two points: (1) As to the qualities of ferro-concrete walls for resisting heat and cold, and (2) Whether they found they got a good architectural effect not merely by decorating the outside of the surface, and if so, could they get it economically?

Mr. E. Warren said he would like to introduce a second question with regard to the possibilities of architectural effect, for he was much struck by Professor Cloquet's conclusion dealing with the æsthetic side of the subject. It seemed to him that if they were to deal with plain surfaces in which construction in the architectural sense was absent, they must resort to some merely plastic form of decoration or applied decoration. To be honest, in dealing with this form of construction, he would like to ask those who had considered the use of the material whether any serious attempt had been made to give it a real constructive or architectural expression, because if there was no constructive or architectural expression in the building, it was not architecture at all. There could be no architectural inspiration, and no architectural enthusiasm could be aroused by dealing with a structure in which they could not give any external expression whatever, and in which no constructive problem arose. If any of the distinguished architects from the Continent would inform them as to what experiments had been made in the direction of the real architectural use of this material, they would all be very much the gainers.

M. Louis Cloquet, replying to the points raised as to the architectural treatment of an armored concrete wall, was opposed to the idea of placing ornament on the wall. It would, he thought, be a great mistake to place anything on the face of the building which was not part of the structure. With regard to the conductibility of the wall, they found it well to have two partitions with a closed air-space in between. Reinforced-concrete had been used on the Continent for domestic purposes to some extent. M. Cloquet concluded by referring to the remarks he made in his paper, in which he pointed out that reinforced-concrete would never eliminate from architectural practice the noble and artistic combinations of masonry work.

A paper by M. J. Bassegoda (Barcelona) was here taken as read. The following is an abstract of the paper:

Building in reinforced-concrete does not solve any new problem either in art or construction; it is a composite building of stone and metallic materials, by means of which, profiting by the qualities of the two components, difficulties are more economically solved than could be done with either of them alone.

Economy in the use of reinforced-concrete does not depend on the low price of the materials of which it is composed, which are comparatively dear, but on their accurate combination, which allows of the quantity being reduced. Economy, consequently, has a limit in the maximum coefficient of ironwork and concrete.

There is no reason why these coefficients, especially that of the concrete, should be higher than in homogeneous constructions, for there are many circumstances, all difficult to foresee, which may produce lower resistances than those which have served as a basis in the calculation; such as quality of the cement, the nature and size of the sand and gravel, and the manipulation and use of the different materials.

This consideration has produced various systems from which cement work has been almost completely eliminated, or in which, at all events, it has not been taken into consideration in the calculation; it is then considered as a simple exterior covering destined to protect the metal against agents which would tend to destroy it, such as oxidation and fire.

Security reaches its maximum in these systems, but, on the other hand, economy diminishes; it may happen that this kind of masonry may become less economical than other homogeneous kinds, such, for example, as brick laid with cement.

In countries where they have excellent brick which, according to an already old-established custom, they use in very reduced thicknesses, either in the parts which give support or in the parts which are supported (arches and horizontal floorings), one might introduce the system of fortifying these constructions, thus obtaining a greater economy in homogeneous masonry work and in fortified concrete work.

In places where construction in brick does not meet the conditions required, the use of fortified cement offers a real and effective economy over all other systems of construction; an economy which should not be exaggerated whilst admitting coefficients of work very superior to those which experience found to be absolutely safe. One can recommend such systems in which the ironwork is adjusted to be able to resist all external force.

With regard to the artistic point of view of the question, reinforced-concrete has no exclusive form; on the contrary, like every concretion, it takes that which is given to it. The supporting element, covering an empty space, may be straight (beam) or curved (arch); the length of the former is comparatively restricted; the length of the latter can be much extended, as is also the case in homogeneous constructions.

In the straight form, as in the curved, the theoretical limit of reinforced-concrete requires, on account of the weight of the concrete itself, the use of a greater volume of iron in the ironwork than is required in homogeneous metallic constructions. The relation or proportion between the units of resistance and of weight is thirteen times greater in cement than in iron. It follows that in proportion as the absolute dimensions of the works in reinforced-concrete are increased, so must the importance of the iron over the cement be increased also, and in consequence the forms then have the characteristics of metallic constructions, as may be noticed in the large bridges.

On the other hand, in architectonic works, in which it is scarcely ever desired to attain the maximum of possible dimensions, the artistic character must come from the lines, projections. and coloration. With regard to the first the architect can choose freely without any restriction; the second, whatever they may be —mouldings, ornamental decorations, etc.—can also be obtained with ease and comparative economy, but with the drawback that for their execution one must have recourse to moulding, which indicates a limitation of artistic effect to which architectonic art cannot bring itself. With regard to color one cannot admit the only one, that of cement; but, on the contrary, this modern concrete must be treated as the ancients treated it, that is to say, by covering it either altogether or in part with other materials of which the varied coloration permits of obtaining the desired effect, as certain architects and engineers are already doing who have succeeded in using fortified cement in their works with a particularly artistic effect.

Mr. Max Clarke said that in the papers which had been read before the Congress and elsewhere it seemed to have been accepted that the material or combination now known as reinforced-concrete was satisfactory in every respect, and the only remark he saw bearing on this particular point was that by Mr. Henry Adams, where he spoke of failures, and that "nothing succeeds like failure" was not a pleasant feature of the case. No doubt they would all like to learn something by failures, but they were naturally anxious that such failures should occur, if at all, in other people's buildings, and not in their own. Where they did take place they were not made as public as they should be. Of course, it was quite natural for a man not to let his failures be more known about than he could help, but, on the other hand, as Mr. Adams observed, it was only by such failures that they learned something about a full-sized experiment. They had a very large number of minor experiments, but not of the failures in a full-sized experiment, and that was exactly what they wanted. In Switzerland last month he heard a great deal of conversation with regard to the failure of a building at Basle, but he could not learn from anybody what the actual facts of the case were, and he did not suppose that if he went there now he would be able to find out the cause of this particular upset. Bearing all this in mind, it seemed to him that an inquiry in the direction of what failures had taken place and their causes would be desirable. Another matter to which he thought the attention of members connected with this class of construction should be called was whether any data existed as to the life of the steelwork in combination with concrete. Most people knew it was a most difficult thing to make concrete sufficiently close or homogeneous so that it would not allow the passage of air or moisture. If not consolidated enough to make it impervious to these two agents, deterioration might take place in the reinforcing bars, and the structure would lose all the qualities on which its stability depended, and on which the calculations had been based. He took it that this deterioration might also damage the concrete itself, not only the steel rods, for once the steel rods began to rust the rust on them would damage the concrete by expansion, and it would be impossible to ascertain what was the nature and effect of the damage (he was assuming that his premises were correct) before the building was so seriously damaged that collapse might occur. They talked in a light and airy manner about adhesion between Portland-cement concrete and steel-work. They also said that they had seen joists of hoop-iron and other sorts of iron taken out of buildings which had been there for twenty-eight years, and that they could see the original glue on them. That he had done himself; but, on the other hand, he had seen a considerable amount of experimental reinforced-concrete, and he had observed that this concrete did not close itself up to the metal, and that there were a number of interstices which had never been filled. They must presume that they were filled with something, and, if it was not with liquid, it was with some vapor, and this vapor, he took it, would be either damp or dry, depending on the state of the weather. This particular phase of this particular type of construction seemed to him to be the one which wanted thoroughly going into. If they erected a building two stories high suitable for an agricultural laborer's dwelling, it did not make much difference whether it lasted fifty years or not; but if they built a building of the monumental type which was supposed to represent a very considerable sum of money, he took it that it was the duty of those who designed the building, or, at any rate, who advocated the use of this material, to be prepared to show what its life would be. So far as he had been able to ascertain no sufficient inquiry had been devoted to this particular point. They were talking about reinforced-concrete because a certain number of gentlemen, whom he called "patentees," and other people called experts, had put the thing on the market. He thought, as architects, they should not be carried away too rapidly. He would like to add that it was quite possible to stick stuff on to concrete, and he had seen it done abroad. They could cast moulds and place them on buildings, but it was not architecture. It was merely sticking a lot of stuff on to a concrete wall. If they were going to descend to that sort of thing in their architecture, it would be very much better if they had nothing to do with reinforced-concrete at all, for they were going to lose something. One other question he would like to ask, and that was on the subject of cost. No one was able to tell him what the cost of a reinforced-concrete building was. If Mr. Goodrich would append to his paper the cost of the building he had described they would have an idea as to whether it was worth their while to depart from their present methods. He moved:—"That it is the sense of this meeting that an inquiry into the cases of failure in reinforced-concrete and their causes would be most desirable."

The chairman formally seconded the resolution.

Mr. Sachs, in supporting the resolution, said it was really of the utmost importance that they should know what the failures were. He was with the mover in Switzerland, a few weeks ago, when the accident at Basle formed the subject of much discussion, and he made what effort he could to get hold of the actual facts of the case. The facts of that case were available in the form of a report by three Borough Surveyors of three of the principal Swiss cities. It was in the form of a confidential report to the Basle authorities, but, although confidential at the time (for the accident occurred in 1901), the authorities were good enough to say that for the object of scientific research the report could be seen. He had a copy of the report, and he had no doubt but that copies of all such reports would be at the service of a committee dealing with the subject. There was a similar case in Alexandria, Egypt, and two or three cases in the United States, and if really independent reports, and not *ex parte* reports, could be put before an independent committee, such as the Reinforced-Concrete Committee of the Royal Institute of British Architects or any similar body, and the causes of failure arrived at and the results summarized, they would be the most valuable lessons they could learn from.

Mr. Henry Adams said that, as one who had suggested a new reading of an old proverb, he would like to support the resolution. They were all agreed that ferro-concrete to be satisfactory should be solid, but they had been told, in the first

place, that the American practice allowed 2½ in. for the aggregate, while the English practice wisely brought them down to 1 in. But neither of these took account of what, to him, was the most important matter of all, and that was the grading of the material to various sizes. This was brought home to him very closely a short time ago, when, after the Fire-Prevention Committee had discovered that broken brick was one of the best, if not the best, materials which could be adopted, a firm in London commenced to manufacture broken brick and screened it to pass a 1-in. mesh. All the smaller material was done away with. They thus threw away what was the most valuable part. If they had simply removed the dust and retained the particles, from ¼ in. to 1 in., he believed they would have obtained a sounder material. When there were alterations and pulling down of buildings and ferro-concrete was exposed, they all knew that spaces did show in the material, and they should not show. If they wanted proper adhesion to the steel they had the concrete solid. He believed that more than one of the failures would be found to arise from the improper mixing of the aggregate, and he looked upon the grading of the material as one of the most important points in connection with it.

Mr. Brownhead asked whether, in discussing that question, they really knew what the subject was before them. They knew what concrete was because they had tests to show just what cement was, but when someone said "reinforced-concrete," he did not know what it was. He did not know what concrete was because they had no standard, and they could not tell by results what would happen with a particular concrete because they had no standard. Therefore they had no reliable information on the subject, and if there was to be an inquiry he would suggest that an endeavor should be made, if possible, to define what concrete was, because concrete might be honestly described as "adulterated cement." That was a very vague term, but all their discussions on the subject were very ethereal and very vague. They wanted some substantial scientific knowledge as to what was the strength of concrete, for at present it was merely a vague term. He had heard concrete described as one of good cement and two of other material, and he had also heard it described as one of cement and twenty of another material. Before they could enter on a scientific discussion on concrete they must define what concrete was.

The Chairman said that from something which had been said it might be in the minds of those present that good practice in America justified the use of 2½-in. stone in armored concrete. It was perfectly true that certain building laws and certain underwriters' rules might permit of such construction, but it was very far from proof that the best architects in America permitted any such construction. The building laws in many States and cities were diverse, but in the principal cities the building laws were coming rapidly to a form in which they prescribed 1 in. or smaller and ¾ in. and smaller in those portions of the concrete which were reinforced with iron. Naturally, in massive concrete, larger stones were permitted. In his own practice, and he thought in that of the majority of architects in America who used armored concrete, it was the absolute rule that in the portions that were reinforced, in the girders especially, the size of the concrete should be 1 in. or less and preferably ¾ in. and less. It was not at all to be assumed that because certain building laws permitted the use of other materials that they were generally employed. It always seemed to him that there were so many sources of possible failure in the use of reinforced-concrete that it ought only to be employed under the most favorable conditions—that was to say, it must be designed by an expert very capable of calculating the strains, and knowing as much about these strains and the way of meeting them as it was possible to know in the present state of the art. In the second place, the drawings and specifications must be of the most rigorous character, and designed in as great detail as was possible before actual construction. In the third place, the materials must not only be wisely chosen, but they must be submitted to rigorous tests, and, in the last place, the depositing of these materials must be done by persons under the most skilful direction and careful supervision. Only under such conditions could they hope to secure a structure in which they could have faith, and with regard to which they could rest with the assurance that it would be what they hoped it would.

The resolution was then carried.

Mr. Sachs said that, as the subject of fire-protection and reinforced-concrete had been so frequently touched upon in the course of the previous discussion, he would propose a resolution which might perhaps seem a little out of place to those who were conversant with the failures of reinforced-concrete in fire, but which he thought might serve as a safeguard to many architects in practice. It was: "That where reinforced-concrete is intended to be fire-resisting the greatest possible care must be taken in the selection of the aggregate, its size, and in the protection of the steel; further, that the aggregate does not exceed what will pass through a 1-in. mesh, and that the thickness of the protection never be less than 2 in." The size of the aggregate was of importance—more important to his mind sometimes than the actual mixture of the aggregate. The protection also was of importance, and the reason why he suggested that 2 in. should be put in the resolution was because so many tried to scamp that protection, and they came across reinforced-concrete buildings in which the protection to the steelwork was supposed to be ½ in., but where they could scrape it off and find that there was not ⅛th of an inch covering.

Mr. E. Sewell (Cardiff), in seconding the resolution, said his more particular object in rising was to speak to a portion of the subject which did not seem to have been touched upon. While a good deal of reference had been made to the failure of ferro-concrete, he did not know whether any real experience of such failures had been given. If not, he would like to give an experience of his own of failure in the use of ferro-concrete. He might preface the reference to the failure by the statement that it was a very happy failure and did nobody any harm. In that sense it might tend to illustrate what seemed to him very important possibilities in connection with the use of ferro-concrete by the architect. In passing, he might say that he had two buildings under construction with that material largely in use, but he recognized a very important disadvantage in using it was that most methods of ferro-concrete seemed to be surrounded by the difficulties of royalties and patents. No doubt, that was a very excellent reward to those whose ingenuity had devised the methods, but, at the same time, one could not help feeling that in practice it was a restriction upon the free and extensive use and applicable use which any building material should have in the architect's mind and on his drawings. To refer more particularly to this question of failure, he might say he had to deal with a building where there was an ordinary street frontage. He decided to use ferro-concrete for the main construction for one reason, which was that the party-walls belonging to the neighbors, and for business purposes, it was impossible to interfere with them. He found the convenience very great of being able to construct the girders within his own building instead of having to swing girders and cut into the party-walls. This being his first experience of ferro-concrete, he did not think it would be a proper thing to put the front on to a main street of this material. He thought there were chances, architecturally speaking, in the immense advantage they got from the great cantilever methods. He thought the ferro-concrete cantilever and its treatment might possibly in the future become a feature for architects to give their serious attention to, but in this case he had nothing of that chance; and simply dealing with a flat frontage he came to the conclusion that the frontage of the building must be of hard stone. Then came the question of how the whole of the floors and a great deal of the side walls and the girder construction should be legitimately united to the front portion of the building, and he decided to have some steel anchors and anchor the frontage of hard stonework into the ferro-concrete. They found one morning that the ferro-concrete had taken care of itself. They finished their ferro-concrete eight inches or ten inches from the front itself, and the anchor was to unite it. But on this particular morning the floors got heavily loaded. A very zealous foreman had removed a certain number of struts in the front, and the whole mass was in just that state that it exerted a pressure toward the front. On examination, he found they were something like eight inches or nine inches out of their true plane. The whole of the girders had swelled forward into the front of the building. He did not think they were removed by human agency, but, at any rate, this happy accident had the effect of throwing the girders right into the cavities, and so quite accidentally they got a united building. It suggested to him that there might be great possibility in the architectural adaptation of the material. It was in that sense waxy; they could alter its contours; and he thought by the use of vertically-curved surfaces there were architectural chances. He did not think at this stage ferro-concrete was sufficiently mobile for their requirements, but it was a great field for architectural study. The application of

surface decoration was, of course, quite easily done, and the fact that ferro-concrete was made in wooden sheeting might lead to the sheeting containing some relief which might become decorative.

Mr. Sachs said that if the suggestion in the resolution of the one-inch mesh was not accepted, he would suggest that the motion be taken on general lines, and therefore he amended it so as to read: "That, where reinforced-concrete is intended to be fire-resisting the greatest possible care must be taken as to the nature of the aggregate and its size and also as to the protection of the steel."

The resolution, as amended, was then put to the meeting and carried.

SUBSTANTIAL PERFORMANCE: NEW YORK vs. HORGAN & SLATTERY.

SUPREME COURT, APPELLATE DIVISION

First Department, April, 1906.

Morgan J. O'Brien, P. J.
Edward Patterson
Chester B. McLoughlin
Frank C. Laughlin
James W. Houghton, J. J.

Horgan & Slattery,
Respondents,
--against--
The City of New York,
Appellant.
No. 8541

APPEAL by the defendant from a judgment of the Supreme Court in favor of plaintiff, entered in the Clerk's office of the County of New York on the 27th day of June, 1903, upon the verdict of a jury, and from an order denying motion for a new trial entered in said Clerk's office on the 23rd day of June, 1903.

Terrence Farley, for Appellant.
Augustus Van Wyck, for Respondent.

HOUGHTON, J.: The plaintiff is a corporation engaged in the business of making plans and specifications and superintending the erection of buildings as architect. Prior to the 25th day of October, 1900, a site had been duly selected for the erection of the 69th Regiment Armory, between 25th and 26th streets, on Lexington avenue in the City of New York. The Armory Board of that City, consisting at that time of the Mayor, two senior ranking officers of or below the grade of brigadier general, in command of troops of the National Guard quartered in the City of New York, the President of the Department of Taxes and Assessments, and the Commissioner of Public Buildings, Lighting and Supplies (Military Code, Sec. 134, Laws 1898, Chap. 212), by resolution directed the plaintiff to prepare plans and specifications for such armory building so proposed to be erected, with estimated cost thereof. Under this employment preliminary plans and estimates were furnished and approved by resolution of that Board, on the 23rd day of January, 1901, and an appropriation of $500,000 was asked therefor from the Commissioners of the Sinking Fund of the City of New York, whose final approval and action were necessary for the raising of funds therefor. On the 8th day of March following, the Commissioners of the Sinking Fund, by resolution, authorized the Armory Commissioners or Board "to take such steps as may be necessary to enter into a contract for the erection of an armory for the 69th Regiment N. G. N. Y. * * * And for the purpose of providing means for the payment thereof, including architect's fees and all incidental expenses connected therewith" the sum of $450,000 was appropriated. Thereafter and on the 3rd day of April following, the Armory Board, by resolution forwarded to the plaintiff, directed it to prepare "detailed plans and specifications in accordance with the plan which has been adopted by the Armory Board and *approved by the Commissioners of the Sinking Fund* for an armory building for the 69th Regiment," and directed that they be submitted for approval to a Committee of that Board appointed therefor. The approval by the Commissioners of the Sinking Fund referred to in this resolution was the approval by the resolution of March 8th fixing the cost at and making an appropriation of $450,000.

The testimony discloses that from the 3rd of April to about the middle of June following a large part of the force of plaintiff's office was engaged in making such plans, and during the summer and fall following the principal part of the specifications were completed. After these plans and specifications had been so completed and approved, on the 19th day of November, 1901, by resolution, the Armory Board directed the entering into with plaintiff of a written contract for the preparation of such plans and specifications and the supervision of the construction of such Armory Building. This was done and by such contract it was provided that the plaintiff should receive 5% upon the cost of the erection of the building,—such commission being sub-divided, 1% for preliminary studies and sketches, 2½% for completed plans and general working-drawings and specifications and details and the balance for further working-plans and supervision of erection,—this subdivision being in case of the abandonment or suspension of the work. By this contract it was provided that the plans and specifications for the purpose of enabling accurate and reliable bids or estimates should be completed on or before the 15th day of October, 1901, a date prior to that of the contract itself. The total cost of the building, including architect's fees, it was provided "should be kept well within the sum of $450,000." On these plans, specifications and details bids were asked. None were received within the $450,000, all being in excess thereof and ranging from $666,394, the lowest, to $744,394, the highest, exclusive of architect's fees. By resolution on the 14th day of January, 1902, all of these bids were rejected because in excess of the appropriation. Subsequently and on the 22nd day of July, following, by resolution, the Armory Board rejected the plans of the plaintiff, terminated its employment as architect, and recommended that $100,000 be added to the appropriation and invited competitive plans from certain architects therefor, and the building was subsequently erected at an increased cost, under the plans of other architects. The written contract with plaintiff provided that if the plans and specifications were not satisfactory, the plaintiff would revise and correct the same to conform to suggested requirements; and the plaintiff proved that it had never been requested to revise the plans submitted, so that the building would cost a less amount to erect. This written contract contained the appropriate certificate of the Commissioners and Comptroller as to appropriation and unexpended balance applicable to pay the moneys provided thereby, but no other contract of employment of plaintiff complied with this requirement.

The plaintiff seeks to compel the City to pay for the plans and specifications so furnished, as well as damages for breach of the contract. The first cause of action alleged is for the 2½% on the proposed cost of the building for the plans and specifications, and the second cause of action is for damages for breach of the contract by wrongful discharge.

The complaint states that the original hiring was October 25, 1900, but on the trial the plaintiff was allowed to amend by adding appropriate allegations as to the making of the written contract of November 19, 1901.

The plaintiff recovered 2½% upon $450,000 for the plans and specifications furnished, amounting with interest added, to $11,833.10 as well as $5,000 damages for wrongful discharge and refusal to permit it to complete its contract to superintend the erection of the building and do the work necessary to earn the balance of the 5% stipulated.

The defendant appeals from this judgment, asserting that the Armory Board had no power to make the contract of October 25, 1900, and that plaintiff can recover for no work performed prior to the written contract of November 19, 1901, even after the resolutions of March 8th, and April 3rd; and further asserts that the written contract executed in November was valid, or that the verbal contract arising out of the resolution of April 3rd was good; that plaintiff failed to perform either of them by furnishing plans and specifications according to which the building could be erected within the stipulated sum of $450,000.

We think it must be held, under the doctrine of this court enunciated in Lewis *vs.* The City of New York (106 App. Div. 454), and Keane *vs.* The City of New York (88 App. Div. 542), and Walton *vs.* The Mayor (26 App. Div. 76) that the Armory Board had no power to incur an indebtedness for architect's fees, which the City became liable to pay, until it had been authorized to incur such indebtedness by resolution of the Commissioners of the Sinking Fund. The resolution of those Commissioners, passed March 8th, 1901, did give the Armory Board authority to employ plaintiff, which authority they exercised by their resolution of April 3rd, following, directing plaintiff to prepare detailed plans and specifications for the erection of the proposed armory. It is only for services performed by plaintiff after this time that the City is liable, if it is liable at all.

It was not necessary to let the contract for the preparation of plans and specifications for the proposed armory by competitive bidding. The services required scientific knowledge and skill, and that character of service need not be obtained by bids. (Peterson *vs.* The Mayor, &c., of N. Y., 17 N. Y., 449-453). Nor was it necessary that the Armory Board enter into a written contract with the plaintiff for the performance of such services. That might be done by resolution and subsequent direction.

The plans and specifications were prepared after the 3rd of April, and before the written contract which was not a necessity. If the plaintiff substantially performed its contract, which we think was to furnish plans and specifications for an armory which could be erected within the sum of $450,000, then it is entitled to recover therefor the customary price, which was proven to be 2½% upon the cost of the building. This, however, the plaintiff did not do. The resolution of March 8th, appropriating the money and giving authority to the Armory Board to proceed and hire plaintiff, limited the cost of the building to $450,000. Plaintiff says it did not know of this limitation until the written contract of November after the plans and specifications had been furnished. The resolution was a matter of public record, and the plaintiff was dealing with a municipality and should have ascertained the limitation of cost. Besides, plaintiff's chief architect, prior to April 3rd, in discussing the preliminary plans with the Chairman of the Armory Board Committee to whom he announced that the proposed armory could not be erected short of $600,000, was told by such Chairman that the Board would never allow more than $500,000 at the outside for its erection. This was actual notice of the limitation, which plaintiff's plans and specifications far exceeded. The bids for erection were the final test of the cost, and all of them exceeded the limitation by nearly $200,000. If there was a limitation within which plaintiff must reasonably come, and within which it was bound to come, the excess cost was so great that it cannot be said that plaintiff substantially performed its contract.

An architect employed to furnish plans and specifications for the erection of a building is entitled to remuneration therefor, if they are made in accordance with the directions of the owner. He cannot recover, however, where the owner stipulates that the plans and specifications shall be for a building not to cost over a specified amount, if the plans and specifications made are for a building substantially exceeding that sum. (6 Cyc. 31; Maack *vs.* Schneider, 57 Mo. App. 431; Feltham *vs.* Sharp, 25 So. East Rep. 619, 99 Ga., 260; Ada St. M. E. Church *vs.* Garnsey, 66 Ill. 132).

The plaintiff failed to bring itself within this proper and salutary rule, and, therefore, should not have been permitted to recover under its first cause of action.

There cannot be said to have been an acceptance of the plans and specifications by the Armory Board, notwithstanding they did not meet the restriction as to cost of erection.

That fact could not be determined until the bids were received and it was thus found what the cost would be; and it is quite doubtful if the Armory Board would have the power to bind the city by the acceptance of plans not in conformity with the contract, and the cost stipulated by the commissioners appropriating the money. If any other reason were needed for the reversal of the judgment, it is found in the charge of the court, which was a substantial direction of a verdict for the 2½%,—the defendant being permitted to except to whatever the court said on that subject.

As to the second cause of action, it is manifest that the plaintiff in no sense showed such a substantial performance of its contract as to entitle it to damages for breach of hiring. It furnished no plans and specifications from which an armory costing within $450,000 could be erected, nor did it conform to the plans already made to a building costing within that sum. The Armory Board, therefore, on disclosure of the cost as shown by the bids had the right to reject the plans and to dispense with the plaintiff's services and terminate the contract Here, too, the court erred in charging the jury that there was no ground for the discharge of the plaintiff, to which the defendant excepted.

The plaintiff complains that it was not asked to alter the plans so that the cost of erecting the building would come within the stipulated amount. It was for the plaintiff to perform its contract and to show that it has so done, before it asks damages for breach by the other party.

It is quite evident that the plaintiff performed a large amount of work for which it would be just that it should receive some compensation, and we have endeavored to find some ground upon which plaintiff could recover the fair value of the work and labor which it performed. The resolution of March 8th empowered the armory board to employ an architect. By the resolution of April 3rd, that Board employed plaintiff. It was necessary for the Armory Board to obtain accurate information with respect to the kind of armory that should be erected. Preliminary sketches might and might not be accurate with respect to disclosing the cost. Plaintiffs did a large amount of work in elaborating the ideas of the Armory Board with respect to the proposed armory and finally by its labors demonstrated that the building could not be erected within the sum provided. The necessity for a larger appropriation was finally recognized by the Commissioners of the Sinking Fund, and they increased it and the Armory in the end was erected at about the cost called for by plaintiff's plans. The work performed by the plaintiff was of value to the Armory Board, and thus to the City, in the final determination as to the style and character of the Armory. Equitably it would seem that the plaintiff can and should be permitted to recover the value of these services performed up to the time of receipt of the bids,—not, however, upon any percentage as to cost of erection, but upon a *quantum meruit* for the actual value of the services in fact performed. It is probable that this sum ought to be limited to the usual charge for preliminary sketches, which would be only one per cent. We do not mean to hold that the plaintiff is entitled to absolutely recover the 2½% upon the cost of erection, or a sum equal to that amount; but if it can recover at all, it should be permitted to recover what it paid out to its clerks and assistants in preparing the plans and specifications, together with a reasonable compensation for the time spent by its chief architects and the advice which they gave to the Armory Board.

The judgment and order should be reversed and a new trial granted, with costs to the appellant to abide the event.

McLaughlin and Laughlin, J. J., concur.

ILLUSTRATIONS

CITY INVESTING CO.'S BUILDING, BROADWAY, NEAR CORTLANDT STREET, NEW YORK, N. Y. MR. FRANCIS H. KIMBALL, ARCHITECT, NEW YORK, N. Y.

PLANS OF THE SAME.

CHURCH OF CHRIST, SCIENTIST, BOSTON, MASS. MR. CHARLES BRIGHAM, ARCHITECT, BOSTON, MASS.

ENTRANCE TO THE SAME.

DOORWAYS OPENING FROM AUDITORIUM OF THE SAME.

HOUSE AT DEDHAM, MASS. MR. FRANK CHOUTEAU BROWN, ARCHITECT, BOSTON, MASS.

LAWN-FRONT OF THE SAME.

HALL AND DINING-ROOM OF THE SAME.

Additional Illustrations in the International Edition.

AUDITORIUM: CHURCH OF CHRIST, SCIENTIST, BOSTON, MASS. MR. CHARLES BRIGHAM, ARCHITECT.

NOTES AND CLIPPINGS

San Francisco Labor Temple.—The Building Trades Council of San Francisco has had plans made for a new Labor Temple to be erected in this city, which will be one of the handsomest and best equipped structures of its kind in the United States. The council has acquired the site on the southwest corner of Fourteenth and Guerrero streets, 90 x 140 feet, which will be entirely occupied by the building, a three-story Ionic temple. The first floor will be arranged for the main office of the council, offices for members of the council and also for the use of business agents of affiliated unions, reading and billiard rooms, and an assembly room in the rear. The two upper floors will contain ten large assembly halls, with committee and ante rooms, and a pressroom equipped and fitted for the exclusive use of reporters and news gatherers. The exterior will be made attractive by large Ionic columns, the harmonious symmetry in the arrangement of windows and trimmings, lending the whole a tone of soft, but pleasing architectural beauty. The cost of the building is estimated at $75,000, and P. H. McCarthy, president of the Building Trades Council, states that it will be finished and ready for occupancy in four months. E. J. Vogel has been selected as the architect for this important work.—*San Francisco Chronicle.*

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SOCIETIES, PERSONAL MENTION, ETC.

FOR very many months a considerable portion of the citizens of Buffalo, guided thereto by most of the newspapers in the city, have lived in the belief that it was no longer desirable that their public buildings should be erected under the charge of a County Architect. The Supervisors who rule Erie County have been divided on the subject, but the majority have generally supported Mr. George J. Metzger, the County Architect, in what very many people believe are needlessly costly and elaborate ways of designing and constructing the public buildings for the County, notably an armory now nearly finished. The Supervisors seem of late to be inclining more toward the popular view of the situation, and at the last meeting the Committee on Laws and Legislation reported certain amendments to the Board's rules, which are designed to set matters straight by requiring that, hereafter, when five thousand dollars or more are to be expended upon a county building the architect to be charged with the work must be selected in open competition. If experience shows, as it unquestionably has shown, that the present method produces general dissatisfaction, there is every reason for making a change in the method. But we do not feel that the rules now under consideration are adapted to produce unfailingly an improved result.

IN case these rules are adopted, the various competitive drawings and specifications for any building likely to cost over the stated limit are to be submitted to an expert who "shall be the holder of a chair of architecture in some standard institution of education within the State of New York," and for his services he shall "receive a compensation *not to exceed one hundred dollars in any case*"! The Erie County valuation of the worth of the men who hold chairs, etc., clearly is not overflattering to those sedentary personages. Still, if any of them consents to expertise [a coined word seems permissible here], say, on a million-dollar building for one one-hundredth of one per cent., and, as required, selects and classifies in order the best three designs, then the County will pay to their authors "not less than $100 to the first, $75 to the second, and $50 to the third, and upon the payment of such award each set of plans and specifications *shall become the property of the County for any use its Board of Supervisors may see fit to make*"! The eagerness with which architects hereafter are likely to seek to serve Erie County will hardly be of the breathless variety. However, if the Supervisors decide to make use of any of the three designs, they "shall employ the services of the architect whose plans and specifications shall be adopted," but they promise that "the amount of the award which shall have been received by him" shall be subtracted from his actual compensation as architect. Probably the Supervisors mean well, and, this being so, it should not be difficult to prove to them that all the experts who sit in chairs cannot, under these rules, prevent the further architectural work for Erie County from falling into the very hands it should be kept out of.

ONE feature of the little competition for public drinking-fountains to be erected in New York City by the American Society for the Prevention of Cruelty to Animals is worth noting. The Society has been given five hundred dollars by a friend of animals, and it offers four-fifths of the sum as a prize for the best design, and will pay the other fifth for the full-size drawings and for supervision in getting out the first casting therefrom. Notice is given, however, that on making such payment the Society "shall have the right to procure and set up as many replicas or reproductions of the design as they may at any or all times desire, without further compensation to the said winner." Here is clear and honorable notice given of an intended duplication of product after a single design, and opportunity is given anyone to abstain from competing on the ground that, while five hundred dollars might satisfactorily enough pay for one fountain, it did not as satisfactorily pay for five thousand. But of even more value is the significant implication that it would be dishonorable to duplicate a product from an architect's design without the designer's being notified originally that such was the promoter's intention.

TRUE to its reputation as a center of discontent, Brooklyn produces another squabble, this time between the Society of Architects—a body we hear of for the first time, one said to be unallied with the American Institute of Architects—and the Tenement-house Commissioner, the grievance being that several hundred sets of drawings for new tenement-buildings are "held up" by him, as he will not approve them as they stand and, seemingly, is not sure enough of his position to return them disapproved. The complaining architects seek to make the public believe that the matter really turns upon the dictionary definition of the word "alcove," but we believe that the Commissioner has a more justifiable

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ground for hesitancy. It appears that for several years the arrangement now found objectionable has been accepted by the Building Department and by the Tenement Commission, and the architects are right in feeling that they ought to have been advised in advance that the authorities were going to reconsider their position. These plans exhibit rooms having, at end or side, a recess or alcove of one size or another, and the architects contend that such alcoves cannot become the "dark room" so abhorrent to sanitarians. The Tenement-house Commissioner points out, on the other hand, that plans in which these alcoved rooms occur declare them to be "kitchens" or "parlors," and that aside from these there are no bedrooms, so described. Further, that as these kitchens and parlors are made from twenty-eight to thirty-four feet long, and, as the alcove at the end is provided with a separate gas-jet, it is clearly the intention of the designer that these alcoves shall be screened off by curtains, or screens, or furniture, and then used as bedrooms, and that by such screening the alcove will become the dark and unventilated bedroom that is forbidden by the law. The Commissioner's inference seems to be logical.

MANY an attempt at "grafting" depends for its successful issue on audaciously taking advantage of the well known fact that what is everyone's business no one attends to. If there is one fact that is generally known to every grown man in this latitude, it is the fact that, to escape the danger of freezing in winter, water-pipes must be laid below the frost line, that is at a depth of five to seven feet, according to the nature of the soil. Yet in the city of Yonkers, N. Y., the water-commissioners—not very wide-awake gentlemen, seemingly—have but lately discovered that water-mains in certain large districts in the suburbs have for some time been laid by contractors in trenches only three and a half feet deep, although the contracts properly called for trenches five feet deep. Naturally, frozen pipes have been quite common in the neighborhood, and yet the residents there, men of average common sense, must often have formed items of the "sidewalk guard" who stood watching the digging of these too-shallow trenches. Where the water-department does its own work, as it can do it only when the outlay is less than the charter limit of five hundred dollars, the books show the cost per lineal foot to be fifty-five cents, yet the fact that contractors were taking large contracts at the rate of twenty-five cents per foot seems to have set no one thinking until quite recently.

THE building or structural mechanic is exposed daily to greater and more varied dangers than the man in the street suspects, particularly in these days of steel-skeleton construction and rapid building, since on the high buildings work must proceed on several levels at once and falling matter that misses workmen upon one floor may reach some at a lower level. The result is that, probably, no high building is erected without causing serious injury to one or more men engaged in its erection, while there are very many that have been the scene of one or more deaths, deaths that are "hushed up" so far as possible, partly to prevent comment by the newspapers, but largely that the morale of the working force may not be wrecked by a wave of that superstitious dread to which the foreign mechanic, now so generally employed on our buildings, is particularly subject. Because of this peril that attends building operations, the labor unions and philanthropists generally are constantly trying to devise reliefs, partly in the way of obligating employers to provide more perfect safeguards and improved apparatus and partly by increasing the indemnity that can be exacted under the various employers'-liability laws. These efforts are more persistently made in Great Britain than in this country, though they are not always crowned with success, no more than the attempt of the Central Federated Union last week to secure the passage by the New York Board of Aldermen of an ordinance intended to secure additional safeguards, but which the Acting-Mayor found himself obliged to veto because its provisions were too loosely drawn. We trust the ordinance, of whose exact provisions we know nothing, may be reformed sensibly and acceptably, as mechanics have a right to be safeguarded from avoidable dangers, and as the cost is finally thrown upon the public at large through the operation of the insurance companies that issue employers'-liability and accident policies, there is no reason why any reasonable ordinance should be opposed by employers, who, when all is said, are as humane and tender-hearted as other people.

IT does make a very real difference whose ox is gored. A few days after one New York coroner declared his belief that members of the Housesmiths' Union were not guilty of murder at the Plaza Hotel, another coroner in the same city rendered a verdict against the contractors, because a member of the same union had met his death by falling from the new Blackwell's Island Bridge into the East River. Evidently the coroners feel that the guilelessness of the members of "Sam Parks's union" is only equaled by their fragility.

MR. C. HOWARD WALKER narrates, as something original and peculiar, the action of the owner of a house he once saw in flames in Constantinople. This worthy Levantine, when the firemen at length appeared and began, after their manner, to bargain with him for the amount he would pay for their services, kept watch upon the progress of the fire, debating with himself whether it would cost him more to let the structure burn up or to pay the firemen for preventing that result. As the flames began to die down before a bargain was struck, he reentered his house and the firemen went about their business, having wetted neither their own whistles nor the house. Though the incident afforded amusement to Mr. Walker, through and because of its local color, he could, if he would look below the surface of things, see essentially the same thing going on at home every day in the week. The cautious Levantine is merely replaced with us by the equally shrewd American owner, who, long before the fire breaks out, has decided that it is cheaper for him to let the building burn and get the insurance companies to pay him for the pleasure than it is to bear the cost of building indestructibly.

SPECIFICATIONS FOR STONE.

THE changes that have been brought about in the writing of specifications by the development of building methods can scarcely be realized except by an architect or building contractor of very long experience. A generation ago the specifications, even for a large public building, could be turned out in short order by the average architect, without outside help. Now, our many-storied skyscrapers, of steel skeleton construction, with the most elaborate steam, electrical, and hydraulic installations, call for the aid of the engineer and the specialist. It is a bald truism that specifications for work of this nature must be absolutely accurate and in fullest detail, or else they are worse than useless. This is, however, one branch of specification writing that has shown little improvement—that which relates to stonework and the choice of stone. The reasons for this are not difficult to understand. The main one is that for twenty years past a very large proportion of all the stonework called for has been in Indiana limestone. This material runs so uniform, and has so few defects, that it is necessary to do little more than specify the variety and grade of stone desired. Now, public taste is running in other directions as well, and free use is being made of marble, granite and sandstone. With these materials, loosely drawn specifications are a constant temptation to quarrymen and contractors. Generally the trouble is not that the man who prepares the specifications is careless, but that he calls for more than nature can furnish, and that he imposes useless or impossible restrictions. If the quarryman or cut-stone contractor finds certain clauses in specifications that cannot possibly be carried out, he presumes a certain ignorance as to stonework in the office of the architect. What more natural, then, than that he should jump to the conclusion that he may permit himself a degree of laxness or even downright dishonesty, and still have his work or his material pass inspection?

During the past quarter of a century decided progress has been made in the study of economic geology. When the science was first taken up as a proper subject for Governmental and State investigation, the geologists devoted all of their time to paleontology and the establishment of the co-relation of the different geological horizons. These abstruse branches still claim most of their attention, but a few have given extended investigation to economical features. The first real work in this line was done, not in this country, but in England. The Royal Commission appointed, near the middle of the last century, to make a choice of a suitable stone for the new Houses of Parliament, went to work most carefully, but in a crude way. Unhappily their selection of the Yorkshire magnesian limestone has disappointed all expectations, for the stone has disintegrated sadly and has proved nothing like as durable as the famous Portland oölite. The work of the commission, however, no matter what its outcome, was a move in the right direction. It has served as the basis for a careful study of economic geology in England. British architects are usually much more precise than their American brethren in stone specifications. Most stones vary more or less in the different strata or beds, and in England each bed is named. For particular work the English architect specifies, not only the variety, but also the exact bed from which the stone he desires must be drawn. We have not yet reached this degree of particularity, but it would add to the uniformity and durability of our stonework, if architects would make a greater effort to familiarize themselves with what has already been accomplished in economic geology. The trouble is that the subject is nowhere taught, and that the literature is widely scattered in dry State and Governmental reports. The one popular work on the subject is "*Stones for Building and Decoration*," by Prof. George P. Merrill, of the National Museum. The Tenth Census goes very thoroughly into the subject, and useful bulletins have been published by the States of New York, Pennsylvania, Maryland, Georgia, Iowa, Wisconsin, Missouri and Arkansas.

The points that it is important to consider, if one would write stone specifications that will leave no loopholes for dishonesty or slackness, are the mineral and chemical composition of a stone, strength and durability, effect of weathering, porosity, texture and crystallization, mode of occurrence (whether massive or stratified), freedom from impurities, and method of quarrying. There have been so many serious delays in the furnishing of stone for important buildings that it is getting to be the custom for architects and building-committees to inspect competing quarries before large contracts are given out. The man who writes the specifications should also have the benefit of extensive quarry observations, if he is to do his best. A study of the weathering of stone can be made with far better effect as it lies in its natural bed than after it has been placed in a building. Besides, we have few stone buildings of any great age. Many of the most popular varieties of stone now in use have been only a few years on the market. No idea of their durability and weathering qualities can be had unless they are carefully examined where nature laid them down. The marvelous growth of our cities and the constant shifting of the centers of business and population have heretofore given but a short life to the average city building. But we occasionally erect monumental structures that are intended to endure through generations. With our great public and office buildings, costing millions of dollars each, we have probably now reached a more permanent stage, and the selection of a durable material of construction becomes important. In the Tenth Census is given the following table of the "life" of the various kinds of American building stones, by the term life being understood the number of years that the stones have been found to last without discoloration or disintegration to the extent of necessitating repairs:

	Life in Years.
Coarse Brownstone	5 to 15
Fine laminated Brownstone	20 to 50
Compact Brownstone	100 to 200
Bluestone (sandstone) untried, probably centuries	50 to 200
Nova Scotia Sandstone, untried, perhaps	
Ohio Sandstone (best silicious variety), perhaps from one to many centuries	
Coarse fossiliferous Limestone	20 to 40
Fine oolitic (French) Limestone	30 to 40
Marble, coarse, Dolomitic	40
Marble, fine, Dolomitic	60 to 80
Marble, fine	50 to 100
Granite	75 to 200
Gneiss, fifty years to many centuries	

The above table is only a rough help to the specification-writer. Each stone must be studied by itself, without regard to its class. There are granites that have begun the process of disintegration before ever they are quarried, and their term of life is short. There are also compact brownstones, in which the cementing material has lost its cohesive qualities, so that the grains of silica and quartz crumble apart like loaf sugar. There are, on the contrary, coarse brownstones, like the English Runcorn, that absorb water like a sponge, and yet have excellent durability.

A great deal of stress is laid on the strength of stone. When crushing tests show a high result, the producer of the stone makes a leading argument of the fact in favor of his material. For ordinary building purposes it makes no practical difference whether a stone can withstand a crushing test of three to four thousand, or thirty to forty thousand, pounds per square inch. A variation of thousands of pounds in crushing strength can be shown by stones from the same quarry, merely by the skill with which the cubes are prepared for testing. Therefore, the ordinary crushing-strength tests made for commercial purposes are largely empirical, and the most careful specification need take no further heed of this question than merely to call for stone of "approved strength."

It is strange that specifications rarely, if ever, make a distinction between varieties of stone of the same general class, but widely different in themselves. For instance, if white marble is wanted, the true carbonate of lime marbles and the dolomites are treated in the specifications as if they were absolutely identical. How often does one see a call for "white marble, sound and free from defects, equal to the No. 1 grades of Rutland White or South Dover marbles." This is as if one should ask for "wood equal to white oak." It is not intended in this place to compare the relative merits of the true marbles and the dolomites. Each has its strenuous advocates. But they should not be confused in the specifications. These documents should always give plain evidence that in the office from which they come the two stones will be distinguished one from the other, and an intelligent choice made. One of the most conspicuous and important public edifices in New York is built of the most coarsely crystalline of the carbonate of lime marbles. Some years after it was erected, it was desired to build an addition. The choice fell on a very fine-grained dolomite. The former stone is noted for its non-absorbent qualities. A drop of red ink can be allowed to stand on its surface for hours, and when washed off leaves scarcely a trace. The dolomite absorbs the ink as a lump of sugar takes up coffee from a saucer. It needs no scientist to predict what a lack of harmony there will be between the original building and the addition in a few years' time. If the specifications had been carefully drawn so as to require an accord between the stones of the two parts, the choice of this particular dolomite would have been impossible. If it is desired to have the widest choice in this variety of stone, the specifications should call for "white marble, either of carbonate of lime or dolomitic composition; the stone to

be equal, if the former, to Rutland, Chester Goodale, or Georgia. If dolomitic, to be equal to South Dover, Tuckahoe, or Lee." This, at least, would be exact and free from the confusion of classing stones of widely different composition in the same category. If it is desired to confine the choice to the true marbles, the specifications should read: "White marble containing by approved analysis more than ninety per cent. of carbonate of lime." In specifying for dolomite it is well that there should be a clause requiring that the stone be "free from spar." In some of the dolomites, particularly in New England, there are embedded crystals of tremolite and other minerals that weather out and leave a pitted surface.

Granite specifications present few difficulties. As this is a bedded stone that is won from the earth by blasting, it is necessary, of course, to provide against "starts and powder-shakes." It is also well to require a freedom from sap, as occasionally stains penetrate the stone for a few inches from the surface and along open seams. Many fine granite fronts and columns are disfigured by splotches of black. These could be avoided by a clause requiring that there be no "knots or concretionary nodules on exposed surfaces." The only objection to this is that with some granites it is an instance of asking too much from nature. If a fine-grained granite is desired, the words "of uniform texture throughout" should always be included in the specifications. There are often bands of porphyritic formation running through the fine granites, and these must be excluded. If granite is called for and a strongly laminated gneiss finds its way into the building, as frequently happens, this is no fault of the specifications, and need not be dwelt upon.

There is a great deal of looseness in the requirements for granite work. The specifications for a handsome business building recently erected in New York called for "bush-hammered finish," but mentioned no particular cut. The contractor gave a good six-cut job, as this is the usual finish for building work and may be understood in the absence of precise instructions. When the stone was delivered, the architect objected; he had specified bush-hammered, he said. After he had been finally convinced that the work came strictly within this category, he showed what it was that he wanted. He pointed to a soft stone, finished with a diamond hammer. As a particular effect was desired, it was necessary to rehammer and painfully rub the stone by hand after it was set in the wall. There have been constant disputes over hammered granite work, but these could all be avoided by care in the specifications. Five grades of fineness are generally recognized, 4-cut, 6-cut, 8-cut, 10-cut, and 12-cut. The cost increases with each degree of fineness. If there is any opportunity to substitute the coarser for the finer finish, the contractor is tempted to avail himself of it. The patent, or bush hammer, was originally made in no other size than with a head seven-eighths of an inch in thickness. The cut then had reference to the number of blades in the head. But if the head is increased to an inch or more in thickness while the number of blades remains the same, it is apparent that this will make an appreciable difference in the fineness of the finish. So it has come about that some people interpret the finish to mean so many cuts to the inch, while others make it mean the number of blades in a standard hammer. Owing to this confusion, specifications should always read: "To be bush hammered, with a patient hammer containing six [or any number desired] blades to a seven-eighths inch head."

A great many mistakes can creep into construction work through the slackness of specifications for sandstone. It is the most difficult of all stones to handle properly in this way. This is probably because of the wide diversity of the formations, and their difference in characteristics. Among the sandstones are found some of the best, as well as the very worst of the structural materials. In one of the varieties, bluestone, the same mistake is made that occurs with the marbles and the dolomites,—no distinction is drawn between the silicious and the argillaceous varieties. Bluestone may be called for, "equal in every respect to the best Hudson River stone," and yet stone from Wyoming or Genesee Counties be accepted. Whatever may be said for the latter stone it cannot be held for an instant that it is equal to the former in the most important elements of strength and durability. This argillaceous bluestone is not included at all in the table of life given above, the bluestone there listed being the silicious Hudson River variety. Bluestone specifications, if the widest choice is wanted, should call for "silicious or argillaceous bluestone, equal, if the former, to the best Hudson River stone, or, if the latter, to the Warsaw or Portageville stone." If it is desired to confine the selection to the strongest variety, "silicious bluestone" should always be the term employed, and the architect should be sure he gets none other.

Sandstone contains an unusual amount of interstitial water, called quarry-water or sap. It is entirely different from ordinary moisture. A stone may be soaked for months in water, but this will evaporate in a few days. But the elimination of quarry-water is a matter of several months. If any of the latter is present when the stone is laid in a building, it is apt to fracture at the first touch of frost. Sometimes it will cause a stone to crumble to pieces, as if shattered by dynamite. Therefore specifications should have a clause requiring sandstones to be "thoroughly seasoned and free from all quarry-water or sap." Another element of weakness is the presence of small bits of clay, not mineralized, or other foreign particles. These are guarded against by a clause that there shall be "no clay pockets, 'nigger-heads,' or concretionary nodules." Another very necessary qualification is that there shall be no "starts, heads, dries, reeds or seams."

With a stone of strongly stratified formation, often running into shale-like laminations, like many sandstones, attention must be paid to the bedding planes. A large part of the trouble that followed the use of brownstone, a generation or two ago, was caused by a failure to lay the stone on its natural bed. A block would be set on edge, and it would continue to scale off, sometimes to a depth of several inches. The architects learned a lesson from this, but they learned it too well. Some of them cannot write a specification without the words "to be laid on its natural bed." Unless a stone is very thin-bedded or of a decided laminated formation, this clause should never be inserted. An expert examination would fail to show the natural bed of very many stones, once they are away from the quarry. In these cases the requirement cannot be enforced, and so it is worse than useless. Here is one evil that the "natural bed" fallacy may work: A contract is given for a building in white marble, the stone to be free from color, and to be laid on the natural bed. In most quarries there are bands of color that generally run at a slight angle to the bed. They do not affect the strength in the slightest degree, but according to the specifications we have in mind, they could not appear on the surface of acceptable blocks. Marble quarries are operated in so-called floors, and one entire floor may be marked by a band of color. If the blocks were set on edge, the color would not show, but this the architect will not permit, although any sound marble will weather just as well on its edge as on its bed. Consequently this entire floor of marble must be rejected, and for what the quarryman cannot help thinking is a mere unreasonable whim.

Even in stratified sandstones the bedding planes do not play the all-important part in disintegration that is usually supposed A striking proof of this is frequently seen. If one will examine the quoins in a building he will very often find that one has scaled with equal freedom on the front and on the side. Both of these cannot be bedding planes, and, in fact, neither one may be.

It was stated at the beginning of this article that the use of Indiana limestone made the work of the specifier easy because of the uniform nature of the stone. The tremendous demand that has existed for limestone for many years has caused the opening of new quarries outside of the original Bedford region. It is well, therefore, always to fix as a standard the output of one of the famous Bedford quarries, even if stone from other sections be acceptable. Quite a little Indiana limestone that has come to New York has stained very badly. This would suggest the wisdom of a clause in the specifications that the stone be "free from all oily or bituminous impregnations." The first building erected in New York of oölitic limestone was the Cotton Exchange. The stone was from Kentucky, and unfortunately it was strongly impregnated with oil, which soon came to the surface and left the walls in the condition in which they are to-day.

Special care should be observed, of course, in the preparation of specifications for additions to existing buildings, unless contrast is sought. It is not enough to call for stone of the same general class and appearance. Chemical analysis, texture, and strength must all be taken into account. It would be well, if possible, to obtain the new stone from the same neighborhood from which the old was taken. The same stone varies sometimes in its weathering qualities according to the local conditions under which it was deposited or erupted. An instance showing the danger of using two different stones in the same building is furnished by the State Capitol of Washington, at Olympia. Use was made of two sandstones, from different localities, that appeared almost identical at first. Under the influence of weathering they grew very dissimilar. An effort was made to bring the inferior

stone back to its original appearance by the use of acid washes. It was an unfortunate expedient, for the treatment only made the defects worse. A striking example of the effect of changing from one material to another is also to be seen in the Washington Monument. The variation in color, fifty or seventy-five feet from the base, is so distinct that it can be noticed miles away when the sunlight falls on the shaft.

Apart from the choice of stone, there are certain details connected with the setting that must be cared for in the specifications unless disappointment is to result. It should be remembered that the word non-absorbent is only a relative term as applied to stone. The slightest porosity, and all stone is more or less porous, means the possibility of staining, unless it is carefully guarded against. Iron rust will deeply penetrate most stones in a short time, and oil is a common disfiguring agency. In the central part of the State of New York is a handsome public building erected of a choice marble. It was set in Portland cement, instead of a non-staining cement, and the blocks were not even treated with asphaltum. As a result the stone is terribly stained. The quarry that furnished the material was almost ruined, for the natural assumption of those who did not know the facts was that the marble itself was worthless. This is a case where the specifications were evidently at fault. Carelessness or ignorance in inspection and supervision of building work frequently works an injury to the material itself. The blame in such cases, too, unjustly falls on the quarry. In the erection of one of the costliest and most elaborate buildings in New York, the exhaust-pipes of the hoisting-engines were turned towards the walls. Day after day they continued to belch against the delicate stone-work showers of steam impregnated with dirty oil from the cylinders. The effect was not noticed until the engines had long been removed and the walls were cleaned down. To this day many architects and stone men believe that the stains, which cannot be eradicated, are a natural defect in the stone.

If one were permitted to sum up the question of stone specifications epigrammatically, it would be: "Do not ask of Nature more than she can give. But where she has been generous, let not greed, nor ignorance, nor carelessness spoil her gifts."

FRANCIS W. HOYT.

A SECOND WOODEN SAN FRANCISCO.

LUMBER is pouring into San Francisco from all directions. It comes by shipload and trainload, and cumbers the wharves, the sidetracks and the yards in vast quantities. At the same time there are endless streams of trucks carting building material from lumber yard to building site, making the scene of the late disaster one of the greatest of human activity.

And yet the demand for lumber in San Francisco is many times greater than the supply, and both the dealers and the transportation companies are putting forth extraordinary efforts to hurry forward shipments, and new sources of supply are being sought in all directions.

Of course, the great lumber marts of the north, of Oregon and Washington, are the chief source of supply, and from those quarters a perfect fleet of lumber vessels is arriving almost daily. Not only all the regular lumber freighters, both steamer and sailing vessels, are in commission, but every available tramp craft is being impressed into the service, and now the lumbermen tell me that they are picking up all the old barges that can be found in the bay and along the coast, and of them making up lumber tows.

Then from Eureka, the great northern California lumber port, comes another lumber fleet laden with the contributions of the redwood lumber camps and sawmills of Humboldt and Mendocino Counties, which are being run to their fullest capacity. The southern redwood camps are also being drawn upon to help out in the emergency. San Jose, down in the Santa Clara Valley, fifty miles south of San Francisco, has very extensive lumber yards, with supply camps and sawmills in the Santa Cruz mountains, and these have been doing a very large business with the city by the Golden Gate.

Add to these supplies the vast output from the interior, from the great yellow and sugar pine fields of the Sierra Nevadas, and you may have a general idea of the present lumber influx to the markets of San Francisco and Oakland, for the last named city is having a building boom as well as the first named; for Oakland had planned a large amount of building even before the earthquake came, and the disaster across the bay has had the effect of quadrupling her operations in this line.

Thousands of homeless people from San Francisco were forced to seek shelter in Oakland and her two adjoining neighbors, Berkeley and Alameda, and large numbers of these refugees have decided to take up their abode permanently on the east side of the bay; and not a few have, furthermore, decided to transfer their business operations also; so this new addition to the population of the towns on the east must, in the first place, be housed; and then many of them must have shops, stores and factory buildings wherein to take up again the activities of life that were so rudely interrupted on the 18th of April.

This condition of affairs therefore forces an urgent demand for new buildings, and these buildings are wanted in a hurry. The family may live in a tent or shack during the rainless season with comparative comfort, but autumn is approaching and the rains may start in early or late; but sometime before Christmas there must be a roof overhead, and fairly tight walls round about, or there will be real suffering.

Possibly the refugee family has been taken in by friends; in this case the welcome, however warm at first, stands a good chance of wearing out at last and consequently here comes another demand for a tenement. Then again house owners have been putting up rents at an unmerciful rate, and this is something than the man recently burned out of house and home and possibly out of business, cannot stand, and he goes out into the suburbs and buys him a cheap lot and thereon puts up some kind of a habitation.

Consequently there is building going on everywhere, and California towns, being largely built of wood anyhow, and there being an extra hurry for buildings, and the frame building being the quickest put up, the great cry is for lumber, and still more lumber.

In San Francisco there is an entirely different proposition and one that presents somewhat remarkable features. San Francisco is in fact building a mushroom town, but as the buildings are for temporary use the town is entirely excusable.

In the first place San Francisco has to do business, because the business is there to do. There is her great home trade, which must of necessity be large, for several reasons; first, there was a very large part of the city that was not burned and the population of this part necessarily became greatly congested with the homeless and refugee element; second, large numbers who left the city just after the earthquake have been, and are returning; third, and what is somewhat surprising, San Francisco is receiving some brand-new accessions to her population, people from outside California towns, as well as from various parts of the country at large, who want to get into the city "on the ground floor" and enjoy the reconstruction boom which they think they can see looming up in the near future. These elements conspire to swell the retail trade, and to provide for the handling of this trade a very large amount of temporary store building has been done on Van Ness Avenue and neighboring thoroughfares lying in the eastern edge of the unburned district.

Next come the wholesale and foreign trades and the manufacturing industries, and to furnish temporary quarters for these the whole of the old downtown business part is being covered with temporary frame buildings, and into these the great bulk of the lumber now in demand goes. They talk of building the permanent structures over these in many cases, so that business will not be interrupted; thus it is very improbable that much of the lumber used in the construction of the temporary buildings will be available for use in the permanent ones; so San Francisco is about to build her burned section up in duplicate.

If the mere temporary reconstruction of San Francisco makes such a draft upon the lumber supply what will the conditions be when the permanent reconstruction gets well started? It is safe to say that the great bulk of the destroyed residence part will be rebuilt in wood, and herein may be seen where vast quantities of lumber will be needed.

A few days since I went across the bay to San Francisco. A brisk, cool sea breeze was blowing over the city from the Pacific, bringing with it a drift of fog, and this fog appeared to mix and mingle with the cloud of dust and ashes rising from the ruins. Together the two elements cast a peculiar drab colored atmosphere over the city and made the scene all the more striking.

Marked changes are being made in the aspect of affairs. Slowly the wreckage and débris are being cleared away, but the sidewalks, even along Market Street, are still blocked with piles of brick and refuse iron; but the streets are crowded and

bustling with traffic and over among the ruins the men are delving with an air of grim determination, and in the meantime there is arising that grotesque city of frame structures that would be hard to classify.

But there was lumber everywhere; on the vessels entering or moored upon the bay; on vessels at the wharf unloading; lumber piled high upon the docks, and load after load of lumber pushing along the crowded and grimy streets to some inland point of destination. Of course, there was a vast amount of other kinds of traffic in progress, but the lumber traffic appeared to predominate over all.

That same day I had a talk with the manager of one of the big lumber firms: in substance he said: "In San Francisco the demand for lumber is many times greater than it was before the fire. This is because practically all of the burned district is being built up with temporary structures. There is a great hurry to get back into business; if the lumber could have been brought upon the ground rapidly enough nearly the whole burned territory in the business section would have been built over by this time.

"They are also just starting in to rebuild the residence portion and, taken all in all, I am of the opinion that to-day not less than one-fifth of the burned district is covered with some kind of new buildings. All of these buildings are erected without permits and are subject to removal by order of the city authorities.

"The demand for lumber has not been anywhere near filled. It would have simply been a physical impossibility to have filled it. I think we could have sold five times as much lumber if we only could have secured the stock. I think, however, that the mill supply will soon be equal to the trade demand. All the old mills are running full capacity and many new mills have been started up since the earthquake, principally on Puget Sound and at Grays Harbor.

"The stock in demand is principally Douglass fir for frames and flooring and redwood for sheathing and interior finish. Redwood has entered very largely into reconstruction and the supply has been good.

"As to prices, logs within the past year have gone steadily up and the advance has been from $5.50 to $10 per thousand feet, and lumber has consequently advanced, and the advance in this market has been from $4 to $5 per thousand.

"This advance is only in proportion to the increased demand, not only in consequence of the San Francisco fire, but from all over; from the east, from Japan, China, South America and Australia, a condition of things indicating world-wide prosperity.

"In San Francisco, judging from present indications, I should say that the city will see such a building, as well as business, boom, as was never equaled by the wildest mining-town ever seen."

H. A. Crafts.

STANFORD WHITE.

"SINCE his death Stanford White has been described as 'that beast,' as a blackguard, as an ogre, Bluebeard and satyr. To answer this by saying he was a great architect is not to answer it at all. He was an architect, but what is more important is that he also was a most kind-hearted, most considerate, gentle and manly man, who no more could have done the things attributed to him than he could have roasted a baby on a spit.

"He was big in mind as he was big in body; he was as incapable of little meannesses as of great crimes. He loved life and got more out of it in more intelligent and in more different ways than any other man of his day in New York City. He admired a beautiful woman as he admired every other beautiful thing that God has given us. It might be the colors of an old painting, it might be the gilding on the carved frame of the old painting, it might be Emma Eames's singing of Massenet's "Elégie" or Blanche Ring's singing of "The Good Old Summer Time," the shoulder muscles of Sharkey, or the cornice of a Greek temple. His delight over one was just as keen, as boyish and grateful as over all the others.

"His brother artists testified that he had not a jealous drop of blood in his veins. No one knew better than he what in another man's work was good, and no one was more quick to say it was good. Of his own work he was sincerely modest, almost to shyness. If you emphasized the work as his work, and not the work itself, he would shake himself like a great bear and turn your remark aside. If the work were good and beautiful, in his admiration for it it did not matter whether it was his or that of an unknown art student. He was always helping these beginners, encouraging, advising, finding them commissions; when he assisted some young man to study art in Paris no one heard of it, as no one heard of the girls he aided for the sole reason that they needed aid. If, through the girl, any one did hear of it he attributed to White the worst motives. Personally I know of many cases where he has helped those who had absolutely no claim upon him except that they were ill and poor. And so far from being the ogre he has been pictured, when a man or a woman was in trouble Stanford White was the first man in New York to whom he or she could turn, knowing that, asking no questions, preaching no sermon, it would give him pleasure to serve them.

"Owing to the nature of his profession he left his mark upon New York City as few other men have done. The people of the whole country know that as a judge or juror he has chosen for them public buildings which stand over all America, and that to him are they indebted for much of the beauty of the White City of the Chicago Fair. But they do not know that nearly every block of New York's greatest thoroughfare is crowded with monuments to his taste and genius, and that for the last twenty years there has hardly been a civic function or public celebration that has not owed to him something of its success. . . . In New York it is impossible for the poor man, the rich man, the man of taste and the man with none, to walk abroad without being indebted to Stanford White for something that is good and uplifting. Is it then intelligent to believe that one whose work was fine, big, and far-reaching could himself have been degraded and contemptible?

"The misfortune was that Stanford White died in such a manner that the last moment of his career blinded people to the years that had gone before, and they judged him by those who for the instant dragged him to their level, not by what the man himself had been or by what he himself had accomplished.

"For Stanford White I hold no brief. He was my friend, and he was kind to me as he was to many others, and I cannot but believe, when the hysteria passes, the world will again know him as I knew him—as a big-hearted, generous, gentle man."—*Richard Harding Davis in Collier's Weekly.*

LIABILITY UNDER A LESSOR'S COVENANT TO REPAIR.[1]

THE moral of the case of Torrens *v.* Walker is that it is legally inadvisable (as well as practically inconvenient) to become the lessee of a house in a tumble-down condition, even though the lessor covenants to keep the outside of the premises in good and substantial repair. In the case in question the plaintiff leased from the defendant's predecessor in title the three upper stories of a house in London, to be used as a private hotel. The lessee was to do the inside repairs, the landlord the outside. On July 13, 1905, the London County Council served on the premises a notice under the London Building Act that the premises were in a dangerous state, and requiring the front and back walls to be taken down in so far as they were broken, decayed or out of form. The plaintiff (the lessee) at once informed the lessor (the defendant) of the service of this notice. The notice was the first intimation that either the plaintiff or defendant had had that the building was in a dangerous state. In the following August all the guests staying in the hotel were given notice to leave, and in November, under a magistrate's order, the walls were pulled down and the premises became uninhabitable. On these facts it was held that there had been no breach of the lessor's covenant to repair. The decision will no doubt surprise lessees, and it is therefore the more important that they should understand its grounds, that they may escape a similar fate. It was held (1) that the obligation of a covenant to repair attaches when and only when the lessor has notice that the building is out of repair. Till the notice has been given he cannot be held liable, so that in this case the landlord's liability did not attach till July 13, 1905. And it should be observed that this rule as to non-liability before notice applies whether or not the covenant provides anything as to the necessity of giving notice to the landlord. The reason for this rule was very clearly explained by Bramwell, B., in another case. He said that it was absolutely necessary to interpret a landlord's covenant to repair as a covenant to repair upon notice—otherwise a landlord might be bound to keep in repair that of which he has no means of ascertaining the condition. It was held (2) that the extent of

[1] A paper by Prof. W. S. Holdsworth, D. C. L., in "The Architect."

the obligation of the landlord's duty to repair depended on the state of the house when it was let. In this case the house was nearly 200 years old when it was let. It was practically a worn-out house, and it could not have been put into a good state of repair by any measures short of taking-down and rebuilding. Several cases have decided that when the lessee covenants to deliver up a house in a good state of repair, the extent of his liability must be measured by the state of the house when he leased it. He is not bound to deliver up a new house when he leased an old one. "With regard," it was said in another case, "to the walls, the floor, the doors, the windows and all the different parts of the house, the tenant is bound where there is a breakage . . . to repair it to the best of his ability; but he is never bound, when a portion of the structure has become absolutely worn out and necessary to be replaced, to substitute a new structure in the place of it. All that he undertakes to do is to patch the thing up so long as it is, in the nature of things, right and reasonable that the thing should be patched up. But when it has got to such a state that patching up is of no avail . . . then the tenant is not bound to put in anything new, or to pay any proportion of the cost of putting in the new thing, because the old one has become unfit to discharge its duty." What is law for the lessee is law for the lessor. The house in this case was when leased in such a state that repairs were impossible. The only thing that remained to do was to rebuild: and this was no part of the lessor's obligation under his covenant to repair.

ILLUSTRATIONS

The Peace Palace Competition.

The jury, consisting of the following persons: the Chairman of the Board of Directors of the Carnegie Foundation, and Mr. Th. E. Collcutt, Royal Gold Medalist, President-elect of the Royal Institute of British Architects, London; Dr. P. J. H. Cuypers, Architect of the Royal Museum at Amsterdam; Geh. Ober-Hof-Baurat E. von Ihne, Architect to H. M. the German Emperor, Berlin; Prof. C. König, O.ö. Professor at the Technische Hochschule, Vienna; M. H. P. Nénot, Member of the Institute of France, President of the Société Centrale des Architectes Français, Paris, and Mr. W. R. Ware, Emeritus Professor of Architecture in Columbia University, New York, met on the third day of May, 1906, at The Hague in the Palace, where the 216 designs, which had been submitted for the proposed Peace Palace, were arranged for their inspection. After determining upon a method of procedure they separated, and each member studied each of the designs by himself. They then reassembled and examined them in a body, rejecting those which failed to obtain a single favorable vote. Forty-four designs then remained for further consideration These forty-four were again examined in detail by each member of the jury and a vote by ballot taken. Those designs which failed to receive at least four votes in their favor were set aside. Then there remained sixteen.

After several renewed examinations, which lasted until the eleventh of May, the jury gave the following verdict by a vote of majority, which in several cases was only a bare majority: The prize of 12,000 guilders was awarded to Design No. 213. Motto: "S'G." The prize of 9,000 guilders was awarded to Design No. 194. Motto: "*Pax* (in gold letters)". The prize of 7,000 guilders was awarded to Design No. 132. Motto: "*Concordia parvæ res crescunt, discordia maximæ dilabuntur.*" The prize of 5,000 guilders was awarded to Design No. 17. Motto: "*L'Art de l'Époque.*" The prize of 3,000 guilders was awarded to Design No. 79. Motto, a graphic symbol. The prize for 3,000 guilders was awarded to Design No. 130. Motto: "*Eirene.*"

The sealed letters which accompanied the designs were then opened and the authors' names disclosed. Of the prize-winners four belonged to the number of architects who had been specially invited by the committee to take part in the competition.

The jury then unanimously agreed upon the following report: The 216 designs submitted to the jury exhibit three types of plan. In some of them the Library and Court of Arbitration are housed in separate buildings, connected by a corridor. In others they occupy the same building, which in some of them is lighted from external courts that are enclosed on only three sides, in others from internal courts, one or more in number, enclosed on all sides. Among these the jury were required to select six designs which should become the property of the committee, and which the committee could use as a basis from which to proceed in finally obtaining from the architect, whom they would employ, a design for execution. In so doing the jury have selected those which, in their judgment, best embody these three different schemes.

FIRST-PRIZE DESIGN, NO. 213. MOTTO: "S'G." M. L. CORDONNIER, ARCHITECT, LILLE, FRANCE.

Of this design the jury say: "This design is an attractive one. Its author has considered that, inasmuch as The Hague has been chosen as the permanent seat of the Court of Arbitration, the building should in style follow the local traditions of sixteenth-century architecture. These considerations have finally prevailed with the jury. The design somewhat emphasizes the distinction between the Library and the Court of Arbitration, which is indicated by the programme, connecting them only by a corridor. But it has failed to give a sufficient unity of character to the two different portions of this structure."

SECOND-PRIZE DESIGN, NO. 194. MOTTO: "PAX (in gold letters)." M. A. MARCEL, ARCHITECT, PARIS, FRANCE.

Of this design the jury say: "In this design, it is only the plan that has at all commended itself. Its general arrangement is very good, and is eminently that of a building standing in a park. The large rooms are well lighted by side windows, and in the rear part the library rooms are admirably disposed around a garden, forming a kind of cloister. But, both in the plan and in the elevation, the lines of the composition noticeably depart from the noble simplicity which should characterize a building devoted to the serious and dignified purposes of the Peace Palace, without at the same time evincing any special originality of treatment."

THIRD-PRIZE DESIGN, NO. 132. MOTTO: "*Concordia parvæ res crescunt, discordia maximæ dilabuntur.*" HERR. F. WENDT, ARCHITECT, CHARLOTTENBERG, PRUSSIA.

Of this design the jury say: "This design meets the requirements of the programme in a simple and straightforward way, though an undesirable amount of space is given to vestibules and corridors. The exterior, though it exhibits a suitable dignity of character, is somewhat stiff and monotonous."

FOURTH-PRIZE DESIGN, NO. 17. MOTTO: "*L'Art de l'Époque.*" HERR O. WAGNER, ARCHITECT, VIENNA, AUSTRIA.

Of this design the jury say: "In the written memorandum, which accompanies this design, the author explains that a Palace of Peace, being something new, seems to him to require novel methods of artistic treatment. The result is interesting and is not without originality, and though the plan has obvious defects, it meets fairly well the chief requirements of the programme."

FIFTH-PRIZE DESIGN, NO. 79. MOTTO, A GRAPHIC SYMBOL. MR. HOWARD GREENLEY AND H. S. OLIN, ASSOCIATED ARCHITECTS, NEW YORK, N. Y.

Of this design the jury say: "The exterior is greatly to be praised both for simplicity and for suitability of character. But the round ends of the principal façade injure this effect, and the room of the Administrative Council on one side and a series of smaller rooms on the other are lighted only from beneath the colonnade. The plan is well studied and is distinguished from most of the others by a notable economy of space."

SIXTH-PRIZE DESIGN, NO. 130. MOTTO: "*Eirene.*" HERR F. SCHWECHTEN, ARCHITECT, BERLIN, PRUSSIA.

Of this design the jury say: "The exterior of this design is well composed, though not particularly interesting or dignified, and while the noticeably unsymmetrical plan shows some careful study, the small, narrow light-areas seem out of place in a building occupying an open site."

ST. MARK'S ENGLISH LUTHERAN CHURCH, ROXBURY, MASS. MESSRS. GAY & PROCTOR, ARCHITECTS, BOSTON, MASS.

CHAPEL AT LAKE WACCUBUC, N. Y. MR. HOBART B. UPJOHN, ARCHITECT, NEW YORK, N. Y.

Additional Illustrations in the International Edition.

THE GROOTE KERK OR CHURCH OF ST. BAVON, HAARLEM, HOLLAND.

THE WESTER KERK, AMSTERDAM, HOLLAND.

FLANK VIEW OF THE SAME.

THE OUDE KERK, AMSTERDAM, HOLLAND.

APSIDAL CHAPELS OF THE SAME.

TOWER OF THE CATHEDRAL OF ST. MARTIN, UTRECHT, HOLLAND.

CLOISTER OF THE CATHEDRAL OF ST. MARTIN, UTRECHT, HOLLAND.

A CHURCH ON THE SPAARNE, HAARLEM, HOLLAND.

NOTES AND CLIPPINGS

THE BEAUTIFICATION OF MENOMONIE, WIS.—There is a deal of good sense in the plan that is to be put into effect to reconstruct and beautify the town of Menomonie, Wis. Menomonie is a busy little manufacturing city of some 8,000 inhabitants, in the heart of the great lumber district of the State. For the successful working out of the purpose in hand it has two very great factors in its favor, namely a fine natural location and a wealthy public spirited citizen of the name of James H. Stout. Mr. Stout has already proved himself a public benefactor by his gifts to his home city, which include a manual training school, a physical culture school, a gymnasium, a natatorium, and a library. The new scheme for the beautification of the town, undertaken at his suggestion and largely at his expense, has received the support of the municipal authorities, and of various town organizations. A Boston landscape architect has been engaged to lay out plans for the reformation. Citizens are to engage to build their homes with some regard for beauty and propriety a fixed distance back from the street, and further to engage to keep their lawns and flower beds and hedges in such shape as will give the town the appearance of a great flower garden. Pavements, sidewalks, and grass plots are to be given consideration, tree planting and preservation, and the planting of vines about homes are to be encouraged, the construction of stables is to be regulated, and finally the relation between the residence and business sections is to be harmonized. Such a comprehensive scheme would not of course be possible of fulfillment in cities of great size, unless, as in the case of San Francisco, the field were well cleared by a fire. But plans looking toward systematic beautification are being carried out in Washington, Boston, and other large cities as far as the limitations of the existing city will allow. It is really to the small towns and cities of from 2,500 to 10,000 inhabitants that such a plan as that of Mr. Stout's ought to appeal. It is to be feared, however, that our civic spirit is not yet sufficiently developed to lead any great number of municipalities to follow Menomonie's lead.—*New York Evening Post.*

THE CAMPANILE OF ST. MARK.—There has been, and still is, a considerable amount of discontent in Venice over the methods followed in rebuilding the famous Campanile of St. Mark, especially with regard to the five large steps at the base, now all above ground, whereas formerly two of them had become entirely covered. The College of Venetian Engineers, presided over by Signor Romanin Jacur, ex-minister, appointed a committee to study the question and report on it. In the report which has now been presented, the committee say they have especially inquired "if the work proceeds, and promises to proceed, according to the sentiment and wishes of Venice," which can be summarized as follows: That the Campanile must stand where it was, and as it was, in order that the historic tower may harmonize as it did before with the Piazza of San Marco. Therefore, no line nor any detail outside or inside the Campanile should be changed, as it would be a profanation to give it a modern appearance. The committee fear that this object will not be attained in the reconstruction, and point to the five steps which are differently cut from the originals. The new steps are polished, placed with geometrical regularity, and all perfectly even in height and width, while the old steps were purposely irregular and rough, producing an artistic effect. The conclusion of the report is rather severe, expressing the apprehension that the new Campanile "will not respond either to sentiment, to history, or to art." In view of these criticisms the municipality has appointed a committee composed of Signor Basile, an architect; Professor Jorini, and Signor Laurenti, a painter, and the art critics, Signori Ricci and d'Andrade, to give their views on the reconstruction of the Campanile.

THE WALLS OF CADIZ.—The historic walls of Cadiz are being pulled down. It has long been the dream of the people of Cadiz to demolish these picturesque but useless walls, to make room for factories and modern buildings. This dream is not without interest to the foreign traveler, since it includes the laying out of gardens and building of modern hotels. It is proposed to utilize the material obtained in lengthening existing piers and reclaiming land from the sea, thus enabling vessels to load and discharge cargo alongside of wharves, instead of, as now, by means of lighters in the often ruffled waters of the bay. The advantage of this to the desired revival of trade in Cadiz cannot be overestimated.—*Boston Transcript.*

SPLITTING GRANITE WITH AIR.—The expansive force of compressed air is employed in a very interesting way by a North Carolina granite company. On a sloping hillside, composed of granite which shows no bed planes, but splits readily in any direction when started, a three-inch bore is sunk about eight feet deep, and the bottom is enlarged by exploding half a stick of dynamite. A small charge of powder is fired in this hole, which starts a horizontal crack of cleavage. Charges increasing in size are exploded until the cleavage has extended over a radius of seventy-five or a hundred feet. Then a pipe is cemented into the bore and air is forced in, under a pressure of from eighty to a hundred pounds. The expansion of the air extends the cleavage until it comes out at the surface on the slope of the hill. A horizontal sheet of granite several acres in extent may thus be separated.—*The Youth's Companion.*

UNCOVERING THE CAUSE OF A RELIGIOUS OBSERVANCE.—At an ancient church at Valsbol, Russia, it has been customary for the congregation, before leaving the church, to turn to a perfectly blank wall and genuflect reverently. The origin of the custom was lost in myth. Inquiring travelers received no answer, even from the old priest who officiated there, except that the custom had been handed down from father to son for ages. No one knew how or when it started. But while some repairs were being made recently, beneath many layers of whitewash and paint was found a picture of the Virgin Mary, which must have stood out brilliantly on the wall five or six centuries ago.—*Exchange.*

A NEW USE FOR OXYGEN.—Serious inconvenience is often experienced in blast-furnace practice by the closing of tap-holes by solid iron so that they cannot be opened without delay by means of ordinary appliances. The trouble is even more pronounced if the blast tuyeres become closed. Hitherto, the opening of closed tap-holes and tuyeres has been effected by driving a steel bar through the metal or by applying heat furnished by coke, petroleum, or furnace gas, or generated by a strong current of electricity. These methods are open to objections which do not apply to the oxygen process recently described by the Chevalier de Schwarz to the members of the Iron and Steel Institute. By the application of compressed oxygen it is found that a closed tap-hole or tuyere can be cleared in a few minutes. The gas is employed in such a way that the iron commences to burn, and a degree of heat is developed which is said to be about 5,000 times that produced by burning an equal volume of hydrogen. The efficiency of the process is shown by the fact that a solid block of cold iron 16 in. thick has been pierced within two minutes. Several blast furnaces in England, France, Germany and Belgium have already adopted the oxygen process, the application of which has been extended in Belgium to the cutting of boiler-plates and tubes. The apparatus is simple and inexpensive, and the quantity of gas used is very small in proportion to the work performed.—*The Builder.*

RESTORING THE VATICAN.—Some of the reports about the condition of the Vatican may be exaggerated, but there is no doubt that important works of reparation have had to be undertaken. The Vatican, it should be remembered, is a collection of buildings, and it would be difficult to ascertain its age. Some archæologists believe there was a mansion on the site in the fifth century, and Charlemagne resided in the Vatican at the time of his coronation. Important works were carried out during the Renaissance period, and the names of the foremost architects, from Bramante to Bernini, are connected with different parts. As the Vatican had always to shelter a large population reparations were not always carried out promptly, and the neglect has produced the usual consequences. At first it was supposed that the necessary works could be carried out for less than £5,000, but it is now believed the cost will exceed four times that amount. If all that is proposed should be accomplished the bill must be enormous. Pope Pius X., being restricted to the palace, has been able to realize the defects which strike many strangers. The variety of people to be met with on the stairs and in the courts is remarkable, but the numerous servants and their still more numerous hangers-on are tenants of some or other of the numerous rooms not far from where the Pope dwells and holds audiences. It is now proposed to erect a large barrack for them near the Belvedere. Opportunity will also be taken to make the galleries more safe, and, in other words, it can be said that a constructive revolution will be accomplished in and around what is, in a historic sense, the most important of all European palaces.—*The Architect.*

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SOCIETIES, PERSONAL MENTION, ETC.

ONE of the matters considered at the late Congress of Architects was how the public might best be educated into an interest in and understanding of the art of architecture. Señor Francisco del Villar y Carmona, one of the Spanish delegates, at the close of his paper, recapitulated his suggestions under eight or nine heads, some of them being merely banal, as the hanging of architectural photographs on schoolroom walls, others seeming to the American mind merely freakish, while others are both ingenious and practical. To Americans, who have no enforced military service, the suggestion that instruction in architecture should be given in barracks to those enlisted men who desire it seems very absurd, though those of us who have lived in Paris ateliers realize that the rank and file of the French army contains not a few conscripts drawn from the classes of the École des Beaux-Arts and that these, at least, would take part in the personally conducted trips about the barrack towns which the speaker suggested might be made regularly with much profit. But as the object of the discussion was to provide means of educating the public and not the art-student temporarily serving in the ranks, the suggestion that the cinematograph should be utilized at public expense is much more to the purpose and the idea deserves to be tried, and with thoroughness.

IT is impossible to believe that the illustrated lectures given at the Boston Public Library and the similar ones given in various schoolhouses in this city, under the charge of the Board of Education, are not productive of good. But it must be conceded that that good is likely to be somewhat evanescent, because these pictorial occasions are spasmodic and incidental, while to achieve lasting results a "damnable iteration" is essential. It would be an interesting educational experiment to select some small town, like Attleboro or Newburyport, Mass., where there are art industries and where the young people naturally gravitate toward them when they begin to earn their own livings, and there operate in public, on the common or wherever else, a cinematograph or magic-lantern, night after night for two hours, throwing upon a screen or wall masterpieces of architecture, painting, sculpture and the applied arts. It is easy enough to picture the interest and attention that would be excited while the experiment was a novelty, but not so easy to conceive what effect, if any, would be noticeable in the community at the end of five years of continuous performance. In these five years boys and girls of fourteen would have been passing through their most impressionable period, and it would seem as if those who during these years had been glimpsing once or twice a week beauties of art of various kinds which were unknown to their elder brothers and sisters should, by this absorptive process of education, be fitted for a higher grade of effort than these elders ever dared to attempt.

AT the instigation of *The Illuminating Engineer*, a very interesting test has been made by the Electrical Testing Laboratories of the efficiency of the Moore Vacuum-tube light, to which we referred a few weeks ago, as compared with that of Nernst arc-lamps and Edison incandescent-lamps. The tests were made in the gallery of a picture-dealer, who, as it seems, always in search of the best lighting for his rooms, has there installed one system after another as it came along, not displacing any of the earlier apparatus, so that the place is essentially a museum or testing-laboratory as it stands. The Moore tube in use had a diameter of one and three-quarter inches and a length of one hundred and seventy-nine feet—sufficiently impressive figures!—and the light issuing from this elongated electric spark, if it is fair so to term it, was photometrically compared with that issuing from seven six-glower Nernst lamps, and again with that issuing from eighty-eight eight-candlepower and twenty-five sixteen-candlepower Edison lamps, the measurements being compared by units.

WITHOUT going into the details of technicality, the result seems to be that, compared on a basis of unit energy, the Moore tube furnishes 20 "luces" as against 11.2 by the Nernst lamp and 3.6 by the Edison lamp, a "lux" being the illumination produced on a vertical surface at a distance of one metre by a light-source of one candlepower. It further appears that this particular tube had been in operation for one thousand hours and that during this time it had caused no outlay for maintenance—the cost of current, of course, being here disregarded in the following comparison. It also appears that the cost of maintenance—the renewing of carbons and replacing of lamps, that is—during one thousand hours of use would be in the case of Nernst lamps $39.20, and in the case of Edison lamps $27.20. If the cost of current consumed in each case chances to be the same—the report is not clear on this head—the balance inclines sharply in favor of the vacuum tube, when economy of

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cost and simplicity of manipulation are considered, while the reproductions of photographs of the picture-gallery, made under the lighting of the three several systems, indicate that the light from the Moore tube has a far higher actinic value than that issuing from either of the other systems tested.

THE number of that respectable and respected branch of the profession that includes the architects who were brought up at the carpenter's bench was diminished by the death last week of Mr. George W. Cady, F. A. I. A., who for forty-six years practised as an architect in Providence, R. I., and who, though just entering his eighty-second year, was still actively engaged in the regular pursuit of his calling. Possibly the young architects of to-day who have profited, and well, by superior educational opportunities, are disposed to look askance at and speak slightingly of the men of the class to which Mr. Cady belonged, but they should remember that if they can believe themselves to be the aristocracy of the profession, these older men who graduated from the bench surely deserve to be held the yeomen of the profession. They had not the opportunities their younger fellows have had, but it is quite possible that they profited by those within their reach in a way that should shame the luckier aspirants for to-day's laurel-wreaths: at any rate, they had the homely satisfaction of housing, in comfort and with such elegance and architectural propriety as their contemporaries could appreciate, the men and women of the great Civil War period, the character-building epoch of this country. The work done by these self-educated architects is not of a kind, perhaps, that would be made the object of an architectural pilgrimage, but it is worthy work, done with purpose and feeling, and, as we say, accepted as satisfactory by the generation for whom it was done. Can more than this be said of the intention and accomplishment of the younger architects of the day who have enjoyed advantages these elders never glimpsed?

IT is very generally known that it is practically hopeless for modern civilized races to attempt to eradicate cholera, so long as the faithful Mohammedan flocks by the ten thousand to the Kaaba at Mecca. The decimation, and worse, that regularly takes place amongst the hordes passing along the great pilgrim routes in Asia would be greatly increased if the majority of the pilgrims were invalids seeking health and not lusty zealots seeking only to make sure of their entry into Paradise properly accompanied with numerous houris. Evil as are the hygienic conditions that surround these Asiatic ambulations, there is every reason for supposing that relatively as great harm is done by the passing through France of the multitudes that flock, at this season of the year, to Lourdes, in the hope that their ills and ails and sores may be washed away in the healing waters which are said never to be changed, and so become fouler and more foul with each succeeding day. Guide-book makers ought to advise with special particularity as to routes and railroad lines and hostelries most frequented by these unfortunates, so that the average sane and sound voyager may avoid them sedulously. The reality of the danger has attracted attention, and recently Professor Jean de Bonnefon has received from over eleven thousand pathologists, physicians and sanitarians their opinion as to the dangerous character of the Lourdes frenzy. The great majority of his correspondents assert their belief in the reality of the danger to the community caused by these convoys of the diseased and ailing. We hope that the five thousand gallons of water from the shrine of Our Lady of Lourdes which reached this country last week for use by the Fathers of Mercy in Brooklyn, on Wednesday, may not be the means of dissemintaing through that community the germs and bacteria lately discarded by the *gueux* and *sansculottes* of Western Europe.

IF M. de Bonnefon and his backers cannot weaken the faith of the Lourdes pilgrims, perhaps they can induce the holy fathers in charge of the sacred spring and pool to treat the water by the Vosmaer ozonizing process. This process seems likely to give a needed relief to the unfortunate city of Philadelphia, for a company stands ready to install a plant at a cost of over a million dollars which shall furnish a million gallons of purified water daily at a reasonable charge, and pledges itself to sell the plant to the city at any time at cost price. By this process the ordinary Schuylkill water is first passed through a rapid sand and coke filter and then through the water thus partially clarified is pumped ozonized air, which effectively disposes of all germs that were not filtered out in the first stage of the process. Various attempts have been made to make use of the germicidal properties of ozone, but they have all been found too costly for practical use, but the Vosmaer system is based on a method of producing ozonized air at so low a cost as to make its use a commercial possibility.

THE curious obfuscation that seizes upon executive officials who hanker to be "doing things," whether they properly may or no, is delightfully made patent in the defensive explanation made by Mr. Shonts, Chairman of the Panama Canal Commission, who seeks to show that the eight-hour law is not applicable to work on the canal. "It is therefore not seen," says he, "why a law passed in the interest of American labor at home should be made applicable to alien labor *who probably never heard of its existence"!* And yet, weekly, we are ruthlessly separating wives from husbands, children from parents, the sick from the well and deporting them, just because these unfortunate aliens had not "heard" of our thrice-blessed labor laws. The elasticity of executive interpretation deserves the attention of our higher courts. In the same "interview," Mr. Shonts gives a curious confirmation of the belief that the whirligig of time does bring its revenges. Speaking of the unsatisfactory accomplishment of negro and Indian labor, Mr. Shonts says: "We are now looking to the securing of white labor from the north of Spain, . . . which gives evidence of being well adapted to the work." One may easily fancy the shades of the countless victims of the companions of Pizzaro gleefully gibbering as they watch the descendants of their oppressors "making the dirt fly" under climatic conditions their forebears could not endure.

PROPORTIONING CONCRETE.[1]

As the uses for concrete increase, the necessity grows for a greater economy in construction. To reduce the cost of materials one naturally considers the use of leaner proportions. To decrease the proportion of cement without corresponding loss in strength, the aggregate must be specially graded or such materials selected as will increase the density of the set concrete.[2]

Just how far it is economical to go in increasing the density depends upon the conditions. If, as might be possible on a small job, the cost of materials is reduced 10 cents per cubic yard by substituting a leaner but denser mixture, and, at the same time, if the cost of labor of preparation is increased by 15 cents per cubic yard, it is obviously poor economy. It may, in fact, sometimes cost more in time and trouble and materials to make a lean concrete of high strength than to attain the desired result by using more cement and the materials nearest at hand.

On the other hand, if a large mass of concrete is being laid per day, it may be good economy to spend money for special tests and provide extra machinery for preparation, and even to pay a higher price for the sand or stone in order to secure that which is best suited for the work. The question, then, is one which must be settled by estimates of cost, and the size of the job is the chief determining factor.

However, special grading of materials is a matter which interests us much less frequently than the practical selection of proportions for structures where the choice of aggregates is limited and the character of the concrete such that the problem is simply one of selecting the best relative proportions of the available coarse and fine aggregate, or, perhaps, comparing two materials which may be obtained at trifling difference in cost. Therefore, before considering the effect of different characters of aggregate, we should first study the experimental methods for proportioning two materials and for simple comparisons of quality.

In experimental determinations for selecting proportions it is a generally accepted fact that for maximum strength we should aim at a mixture having the smallest percentage of voids, but it is by no means settled as to *how* this result shall be obtained. even experimentally. For convenience in studying the question we may classify the various plans which are followed:

(1) Arbitrary selection; one arbitrary rule being to use half as much sand as stone, as 1:2:4 or 1:3:6; another, to use a volume of stone equivalent to the cement plus twice the volume of the sand, such as 1:2:5 or 1:3:7.

(2) Determination of voids in the stone and in the sand, and proportioning of materials so that the volume of sand is equivalent to the volume of voids in the stone and the volume of cement slightly in excess of the voids in the sand.

(3) Determination of the voids in the stone, and, after selecting the proportions of cement to sand by test or judgment, proportioning the mortar to the stone so that the volume of mortar will be slightly in excess of the voids in the stone.

(4) Mixing the sand and stone and providing such a proportion of cement that the paste will slightly more than fill the voids in the mixed aggregate.

(5) Making trial mixtures of dry materials in different proportions to determine the mixture giving the smallest percentage of voids, and then adding an arbitrary percentage of cement, or else one based on the voids in the mixed aggregate.

(6) Mixing the aggregate and cement according to a given mechanical analysis curve.

(7) Making volumetric tests or trial mixtures of concrete with a given percentage of cement and different aggregates, and selecting the mixture producing the smallest volume of concrete, then varying the proportions thus found by inspection of the concrete in the field.

Still further variety in methods is produced by different handling of the stone and the sand, some engineers measuring the voids in the stone loose, while others compact the stone to a greater or less degree. Other complications are introduced by the different methods of determining voids, whether by pouring water into the stone or sand, pouring the stone or sand into water or weighing and calculating the voids from the specific gravity.

After the proportions have been selected, the questions arise as to whether we shall frame the specifications to require loose or packed measurement of the aggregate, loose or packed or arbitrary measurement of the cement, or weight measurement of all the materials; or shall the specifications state that the concrete shall contain a certain quantity of cement in a cubic yard of concrete? Shall we adopt two aggregates, merely sand and stone, or shall we mix two grades of sand and two grades of stone? These are some of the problems which confront the man who would proportion his concrete for maximum economy.

At the outset we must admit that the nature of the materials used in concrete, the daily and even hourly variation in the quality, sizes and percentage of moisture, prohibit absolute accuracy either in fixing proportions or in practical measurement of materials. Yet different methods of testing for the purpose of fixing proportions in advance may produce, with the same materials, as great variation as between 1:2:4 and 1:3:7½. Surely such possible variations are not to be ignored. Differences in the methods of measuring proportions by the contractor may produce nearly as great variation.

It may be well to review first the causes of the variations in tests for proportions, the sources of errors and the part which good sense and careful judgment must play in the matter. Suppose we consider what may be termed the ordinary method, which is most commonly given in print and employed quite widely in practice—the method of first determining, separately, the voids in the stone and the voids in the sand, and then proportioning the volume of the sand equivalent to the voids in the stone and the volume of cement slightly in excess of the voids in the sand. The chief variation in the stone, if it does not contain sand or dust, is due to the degree of compacting. Some adopt loose measurement and others packed, while many use slightly shaken measurement. One man may measure broken stone *loose* and find 50 per cent. voids, while another may take the same broken stone and, compacting it, obtain 40 per cent. voids. The proportion of sand in the two cases, if selected strictly by the test, will vary accordingly. The size of the measure also affects the voids.

The voids in stone above three-eighths of an inch may be correctly determined either by pouring in water, or by weighing and calculating from the specific gravity. In either case, if a porous stone, correction should be made for water absorbed in the pores. Most rock in this vicinity is so dense that this absorption may be neglected. If the stone contains dust, even a small proportion, the air is held in the pores and inaccurate results are reached. Accordingly, for fine material, it is more accurate, in fact necessary, to adopt the weight and specific-gravity method. This is also the simplest method with sand, as the specific gravity of sand averages about 2.65. In the vicinity of Boston I have found it slightly higher than this, ranging near 2.7, probably owing to the pieces of trap and other heavy rock contained in it. Either figure is sufficiently accurate to use for void determinations, provided one desires to test the voids. The moisture in the sand must be corrected for by drying a sample and determining the percentage of moisture.

It is thus comparatively easy to find the voids, both water and air voids, in a certain sample of sand, but when we come to figure from these voids the proportion of cement to select, we meet with a greater difficulty than in the relation of the stone to the sand. How shall we select the sample of sand? Shall it be dry or moist, loose or shaken, measured in a small measure or in a large one? Every one of these variations will give a different ratio of cement to sand. Examples of actual tests in my laboratory show that in ordinary bank sand with natural moisture there may be a difference as great as from 53 per cent. voids when the sand is measured loose to 42 per cent. after shaking.

The effect of moisture on Cowe Bay sand came to my notice in a practical way in connection with tests at Jerome Park Reservoir last winter. In order to make an entry upon one of the tables, although not for direct use in the experiments, as we considered that a knowledge of the voids in sand was of little value, a sample of sand which had been dried in the laboratory was weighed. Its weight was found to be 103 pounds per cubic foot, corresponding to 38 per cent. voids. The same sand was then placed out of doors during a rain, and after lying in the sun for two days following was retested and found to weigh 83 pounds per cubic foot, corresponding to 52 per cent. voids. By the theoretical method of proportioning, in one case the proper mortar would be about 1:3 and in the other case about 1:2, and yet the sand was the same and, therefore, the 1:3 mortar would have been only about two-thirds as strong as the 1:2.

[1] A paper by Mr. Sanford E. Thompson, M.B.S.C.E., read before that Society and published in the "Journal of the Association of Engineering Societies."

[2] The term "density" I use in its now generally accepted meaning, as the ratio of solid particles in a unit volume of concrete. It is thus the complement of the voids. For example, if a piece of concrete has 15 per cent. voids (including the air and the water), 85 per cent. of its volume must be solid material, and its density is 0.85.

I made the statement a few minutes ago that different methods of testing might result, with the same materials, in proportions as widely different as 1:2:4 and 1:3:7½. The case cited shows this difference in the mortar. The difference in the ratio of sand to stone (*i.e.*, 2:4 in one case and 3:7½ in the other) may be reached on the one hand by measuring the stone loose and finding 50 per cent. voids, and on the other by compacting it before measuring the voids and finding 40 per cent. voids.

Perhaps I have dwelt too long upon the inaccuracies of proportioning, but it seems to me that this is a matter of the greatest importance to us in order that we may avoid such inaccuracies, or, at least, exercise very careful judgment in drawing conclusions from them. For example, in the case just mentioned, which is correct, the 1:2:4 or the 1:3:7½? In other words, shall we measure the stone loose or compacted, and shall we measure the sand dry or moist? Or shall we throw aside this method of determining proportions and select some other? As I shall suggest presently, personally I do not place much dependence upon the determination of voids in the different dry materials because of the variations I have mentioned. However, some information may be gained from such tests, if the character of the materials is taken into consideration and the methods made to apply to them. For certain materials, for example, the stone may be compacted before measuring the voids and the proportion of sand thus formed, measured loose, will be sufficient to fill the voids when making the concrete. This is the case when the stone is coarse and of fairly uniform size, such as 1½-inch macadam stone, and contains no small stone. The voids are then large, and particles of ordinary sand will fit into them. On the other hand, if the stone is crusher-run, even with the dust screened out, and the sand contains a large proportion of coarse grains, many of these grains will be too large to fit into the smaller voids of the stone, and, therefore, will increase the bulk. Consequently, a larger quantity of the smaller grains must be had, and to do this the total quantity of sand must be more than enough to fill the voids in the compacted stone. This question of the relative sizes of the grains, which I think was first brought to notice by Mr. William B. Fuller, is frequently neglected in fixing proportions.

This principle is well illustrated in the use of gravel and sand screened from it and remixed. Ordinarily screened gravel, measured loose, has about 40 per cent. voids, so that one would naturally expect a mixture of, say, 1:2:5 to work satisfactorily. If the gravel is compacted so that its voids are 32 per cent., the theoretical mixture would be 1:2:6. However, in practice, the grains of the gravel and sand overlap each other; that is, the smallest grains of gravel are smaller than the coarsest grains of sand, and the voids in the gravel are consequently too small for the large sand grains to enter, so that it is sometimes necessary to use half as much sand as gravel in order to prevent large voids in the concrete.

Experiments by Mr. Rafter, which are of very great value and have been widely quoted, show a surprisingly small proportion of sand. He used 35 per cent. mortar and 40 per cent. mortar both in test and in practice; *i.e.*, the volume of mortar was 33 per cent. and 40 per cent. of the volume of stone slightly shaken. Now, even the larger per cent., 40 per cent. mortar, corresponds to proportions with as little sand as 1:2:6, which probably none of us could use with our New England sand and make good concrete. Our materials would require a 1:2:5 or 1:2½:5 mix. However, if we examine the analysis of Mr. Rafter's sand, we find that 92 per cent. of it passed a No. 30 sieve (30 meshes per linear inch). The grains were thus small enough to enter the voids of the stone without appreciably increasing the bulk; in fact, in many of Mr. Rafter's tests the volume of the concrete was considerably less than the broken stone slightly shaken. His sand, although apparently so fine, was not of bad quality for concrete work, because there was very little dust in it, and therefore the cement entered the sand voids.

We are coming now to one of the principal points which I wish to make in considering this subject of proportioning. The cases cited show that the experimental void determinations cannot be expected to give practical results, but various allowances must be made. Now, why not, instead of making tests one way or another, guessing at the best way to handle the materials and then altering the proportions by judgment, why not, in the first place, or, at least, after rough determinations to serve as a basis, make up trial mixtures of the materials with the stone and sand and cement and water, and determine, from the appearance of this mixture and the quantity of concrete made from it, and, to go a step further, from the density, or, in other words, the percentage of air and water voids which it contains, whether the proportions are correct? If only two materials are available, the proportions of sand to stone may be determined, after selecting the percentage of cement, by mixing the materials in several proportions and selecting the one giving the smallest volume with a given weight of aggregate (corrected, if necessary, for difference in specific gravities); also, judging by the appearance of the mixture, taking care on the one hand that there is sufficient mortar to fill the voids in the stone—that is, that there is a slight excess on top when lightly rammed—and, on the other hand, that this excess is not too great. The appearance of the concrete also should not be coarse, but there should be enough cement and fine particles of sand or dust to fill the pores and make a fairly smooth mortar.

In the field this method of inspection is also applicable. In laying the reservoir bottom at Jerome Park, New York City, for example, there was more or less variation in the broken stone and screenings from day to day, and the inspectors were given authority to slightly vary the relative proportions of these two materials, always keeping the proportion of cement to total aggregate at 1:7, so as to give a mix which worked just right in place.

I will not go farther into the methods of making these tests, because I do not wish to take too much of your time, but shall be very glad to answer questions in regard to them. Materials cannot be satisfactorily mixed dry by trial with ordinary apparatus and thus proportioned, because there is so great separation of the coarse and fine particles. Then, too, the addition of the water changes the relations, since a fine sand requires more water to produce the same consistency than a coarse sand, and consequently makes a larger bulk of mortar. Therefore, for the trial mixtures all of the ingredients must be used, including the cement and the water, as well as the aggregates.

The methods are very useful not only for determining the proportions of two materials, but for comparing the value of different aggregates, and also selecting proportions where the aggregate is separated into three or more parts. I have just completed a series of tests for a client in which we found that by changing and grading the sizes of the particles, we could obtain a strength two and a half times as great with the same proportions of cement, while, on the other hand, we could maintain equal strength with 40 per cent. less cement. In connection with such combinations, the use of mechanical analysis diagrams and curves very greatly facilitates matters, and in many cases the correct proportions can be directly predicated in advance if the mechanical analysis curves for the different materials are plotted from the sieve tests and combined. Mechanical analysis methods are eminently scientific and should be destined to greatly increased use both alone and as an auxiliary to other methods of testing.

From these somewhat general observations and from the results of tests which cannot be presented this evening, we may offer the following suggestions as guides to proportioning:

(1) The size of the largest stone in the aggregate should be as great as is consistent with proper placing of the concrete.

(2) If size of stone is small, a richer mixture must be used; thus 1:3:6 is a fairly rich mix with 2-inch stone, but a lean mix with ½-inch stone.

(3) If sand is fine, a smaller quantity may be used in proportion to the stone.

(4) For concrete a sand with too large a percentage of very coarse grains may be detrimental, because they will not fit into the voids of the coarse aggregate.

(5) If the broken stone or gravel contains fine stuff, a smaller proportion of sand must be used.

(6) Better proportions are obtained in practice by screening the sand or dust from the coarse material and remixing in required proportions than by using the run of the bank or the run of the crusher.

(7) If the mortar in concrete is rich, say, up to 1:2½, sand should be coarse, with comparatively few fine grains. A lean mortar, on the other hand, is improved not only in strength, but in smoothness of working, by using a sand containing dirt or dust.

(8) If fine sand must be used, the proportions must be richer than for coarse sand, because a fine sand makes a mortar of lower density.

A very important point still in question is with reference to the use of fine sand for water-tight work. A few permeability tests which I have made recently indicate that a slight excess of fine grains in the sand is often beneficial for concrete designed for

water-tight work. For example, I greatly increased the water-tightness of a 1:3:6 concrete made with ordinary coarse bank sand of a quality to produce a strong mortar by substituting for one-sixth part of the sand an equal weight of very fine bank sand. This fine sand decreased both density and strength and yet increased the water-tightness. A further increase in fine sand did not appreciably affect the water-tightness at an early age, but on longer time tests the specimen with the small addition of fine sand was much superior to those with a larger quantity of fine grains. In a 1:2:4 concrete made with coarse bank sand, an addition of fine sand did not improve it, evidently because there was a sufficient excess of cement to render more fine sand unnecessary.

REVIVAL OF THE OPEN-AIR THEATER.

AN hour's ride in an express train from Paris, and then a long climb up the side of a hill in a four-horse brake, bring one to the wide, sunny plain of Champlieu, in the heart of Compiègne forest. It is in this plain that the Romans, fifteen centuries ago, established one of their stations, with a theater, a temple and a fine bath-house. The ruins of all three still stand, and the theater, discovered forty-five years ago and put in a certain amount of order, was opened on Sunday, July 8, by the French Minister of Fine Arts, in the presence of some three thousand persons.

Champlieu theater is a deep semi-circular cutting, almost cup-shaped, except that the proscenium, or stage side, is open. The uneven, grassy stage is, at its highest part, some ten or twelve feet above the lowest seats of the auditorium, and it terminates in a high green hedge, behind which are the dressing tents of the actors. There are two openings in this hedge for exits and entrances. The theater faces north, so that the spectators are little incommoded by the sun during the afternoon. Moreover, the first words spoken on the stage show that the acoustics are perfect; not a syllable is lost in the light breeze of an ideal summer's afternoon.

There are few of these antique Roman theaters in France, and Champlieu is not equal in archæological interest to the larger and more famous Orange theater. At first glance on Sunday it was even a little disappointing, since the ancient stone benches were hidden from sight beneath deal planks and crimson cushions. After walking through the circular passage between two walls of solid stone masonry, with their two openings for exits, or *vomissoires*, this extremely modern touch seemed incongruous. Down on the proscenium one or two mossy slabs were lying half-embedded in the sward, and everywhere on the stone walls of the theater grasses and flowers, roses and brambles in full and beautiful bloom were growing in profusion. When, presently, old Bacchus came ambling in, seated astride of an ancient ass, with half a dozen sheep and lambs gamboling around him, he looked delightfully in character with his beautiful background.

After more than fourteen centuries of silence the theater in Compiègne forest rang again with heroic words and appreciative applause. Occasionally, too, there were smothered sobs, for after the humorous satire of "Le Cyclope" came the tragic "Iphigenia," and Mme. Dudlay, of the Comédie Française, clothed a mother's despair in such living, graphic gesture and tones as to wring tears from a good many eyes. For it was Euripides' plays that had been chosen for the occasion, and after laughing at the grim Polyphemus's (M. Albert Lambert) jokes about the cannibal feast, he meant to make from the flesh of Ulysses (M. Silvain), and witnessing the final victory of mind over matter, when that hero poked out the only eye of the Cyclops, the audience was invited to watch the other victory of Greeks over barbarians and the rescue of the fair Iphigenia from the sacrificial knife awaiting her. Ulysses and his four companions in the former merry play looked as if they had stepped from off a Grecian vase, so marvellously well imitated were their dresses. They stalked about as though quite accustomed to turf. But the unevenness of the ground confused the women a little in the second play, and the two who figured as Chorus, in long, white drapery tightly swathed around their figures, hardly ventured to move when once they had descended a few steps toward the front.

There are now fully a dozen open-air theaters in full swing in France. The most successful are those at Orange, Bézier, Champlieu, the Theatre de la Verdure, in the Bois de Boulogne; Nimes, Bussang, Canterets and Champigny. Not only Greek tragedies, but operas of Gluck and comedies of Molière or of Meilhac and of Libiche are produced in these rustic arenas, and at the Theatre de la Verdure, near the Pré Catalan, a few nights ago a remarkable series of dances was given in the presence of King Sisowath of Cambodia and of Mr .and Mrs. Longworth. The trees and shrubbery on these occasions are illuminated by changing tones of light from elaborate electric lamps, and the effect is something fairylike. This midsummer development of the French stage assumes larger proportions each season, and this year is more popular than ever before.—*Paris correspondence of the N. Y. Tribune.*

EARLY ILLUMINATING OILS.

AS I listened to these various remarks, said Professor C. F. Chandler at a recent meeting of the Illuminating Engineering Society, my mind went back to a time when no one knew anything about electric lighting and gas was a new thing. Sperm oil sold for $1.75 a gallon by the cargo, and $2.25 at retail fifty or sixty years ago, and at that time the cost of artificial illuminants was one of the most serious items in domestic expenses. I remember in my early boyhood when they began to build the gas works at the foot of the street in New Bedford on which I lived. There were gas works in existence at that time, but they were confined to a few of the large cities. I spent much time in watching the operations as they dug the hole for the gas tank, built the benches, set the retorts and started the works; and when my father actually put pipes into the house and had burners put on, the light seemed most marvelous. In my boyhood we had nothing but oil lamps. I have in my museum in Columbia an old brass lamp with a little crooked handle on it, which my grandmother used. She would hold the little lamp between her eyes and the book she was reading to me, and that was artificial illumination in those days. Then there was an improvement. Some one conceived the idea of substituting camphene, refined spirits of turpentine, and that was introduced as a substitute for sperm oil. It was very inflammable and evolved a combustible vapor, and we had numbers of explosions from it; but it gave such a brilliant light and was so cheap, that people burned it and took the chance of the explosion and the terrible accidents which occurred, for the sake of getting something that was within their means. I do not remember the price, but it did not cost more than one-third as much as sperm oil. The difficulty was that it could only be used with a chimney. The turpentine is so rich in carbon that it gives a smoky flame, and it was necessary therefore to burn the camphene in a lamp with a chimney. But an ingenious chemist produced a satisfactory oil for portable lamps without chimneys by combining camphene, too high in carbon, with alcohol, poor in carbon, producing the so-called "burning fluid" which was used in high glass lamps, without chimneys, having two plain, unusually long wick tubes. These old "fluid" lamps are now being sought in all the old attics in New England and sold to the ladies, who have kerosene burners put on them and pretty shades and use them to decorate their tea tables. But I am afraid there must be a factory where they make them, as there are so many of them being discovered and sold.

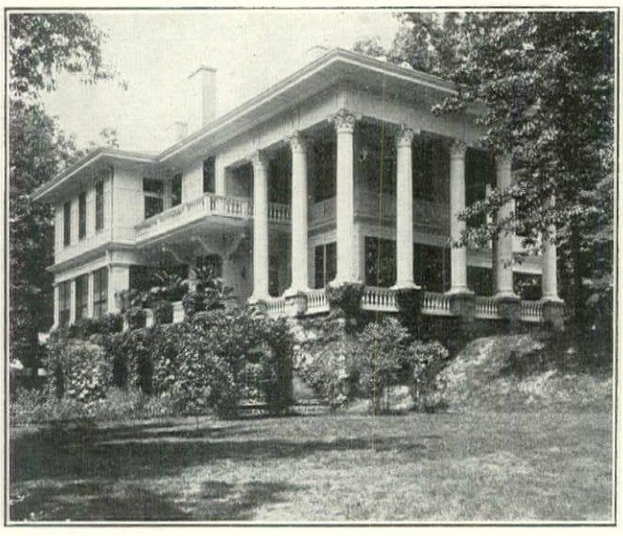
I went to Germany to study chemistry. When I entered a German family, as a boy, in Berlin, there was a glass lamp placed on the table that held a queer looking oil. It had a smell different from sperm oil, and I inquired of my host what it was and he said it was a "Photogen" lamp. I inquired of my professor what this new oil was, and he said it was made from boghead mineral, which came from Scotland, and that parties in Scotland had begun to manufacture it on a large scale. I was so much interested that I immediately sought for information, and secured one or two pamphlets which had been published on the subject of this coal oil, giving an account of how the oil was manufactured from the boghead mineral, which came from Torbano Hill, Scotland. When I came home, in 1856, and told my New Bedford friends, who had their whale- and sperm-oil refineries and candle works, about an oil made out of a mineral dug out of the ground, they shook their heads and said that nothing could ever interfere with the prosperity of the sperm-oil industry. I was interested in the oil and wrote to the *Scientific American* and offered to write an article on the new oil which was burned in Germany, if they would promise to publish it; they wrote back that they did not think any such oil as that would ever interest the American public. In less than three years after that, there was a series of coal oil factories from Portland, Me., down to Wilmington, Del., manufacturing the so-called coal oil or kerosene. It was made out of the boghead mineral which came from Torbane Hill, Scotland; Albertite, which came from Nova Scotia; Grahamite, which came from Ritchie County, W. Va., and Breckinridge coal, which came from Breckinridge County, Ky. As soon as this coal oil made its appearance lamps were invented to burn it, and the

price of the oil dropped down to 50 cents per gallon. The coal oil industry was firmly established and light became much cheaper.

Then a couple of Yankees from New Haven went to Northwestern Pennsylvania, where they saw oil on the surface of the ponds, and some of this oil was skimmed off the ponds and taken to New Haven to Prof. Silliman, who examined it and said it was nothing but crude kerosene oil. They asked him if it was useful, and he said that it certainly was if they could get enough of it. They went back to Oil Creek, in Pennsylvania, but did not dare to make any very definite bargains with the farmers. They prowled about and found places where there was scum on the water and made contracts with the farmers to gather the oil on a royalty. They gathered a few barrels of it and then selected a man, Col. Drake, and put him in charge and organized the first petroleum company in the world, the Pennsylvania Rock Oil Company. Col. G. L. Drake was made the superintendent, and went to Oil Creek to take charge of the collecting of the oil. He learned that in 1819 oil was accidentally obtained in boring two salt wells on the Muskingum River in Ohio, and that in 1829 a flowing well was accidentally obtained at Burkesville, Ky. He became possessed of the idea that he might obtain oil by boring for it, so he erected a derrick and started to bore an oil well. The old farmers came from miles around to watch the boring operation, with a feeling that Drake might with equal reason bore for whiskey. But on the 26th of August, 1859, he "struck oil" at a depth of 71 feet, and obtained 400 gallons, which he sold for 50 cents a gallon. Soon a forest of derricks sprang up, extending into West Virginia and Ohio. Successful wells yielded from 100 to 2,000 barrels of oil daily. The Noble well yielded in a little more than one year 500,000 barrels of oil; the Sherman well in two years 450,000 barrels, and petroleum became one of the most valuable productions of the United States. The yield in 1904 was over 100,000,000 barrels. To-day the price of refined petroleum for use in lamps is 5 cents a gallon in bulk.

A MODERN GEORGIA HOUSE.

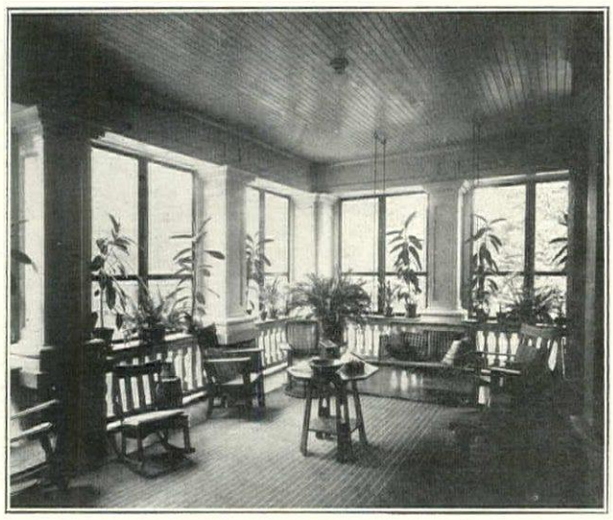
"WOODLAWN," the suburban residence of Mr. J. H. Nunnally, is situated on Peachtree Road, near Atlanta, Ga. Originally the site had little to recommend it to the casual, who, as is well known, often come face to face with the picturesque without recognizing it—a fault lying more with their stars than with themselves, perhaps. The ground lay unevenly. From the street it sank suddenly to a veritable gulch, rising some two hundred yards away on the extreme north boundary line to a point level with the street whence ran a ledge some twenty or thirty feet wide to what is now the gateway. It was on this point that Mr. Nunnally elected to build his house, leveling off the ridge as a driveway to the road and leaving the beautiful undulating



HOUSE OF J. H. NUNNALLY, ESQ., ATLANTA, GA.

land to the south undisturbed. The effect is sylvan to a degree, exquisitely natural and therefore exquisitely beautiful. Grading would have destroyed the noble trees that shade this undulating but perfectly kept lawn, and by the same token it would have destroyed the romance (if romance is the word) which the very unusualness of the treatment lends to this perfectly modern colonial house.

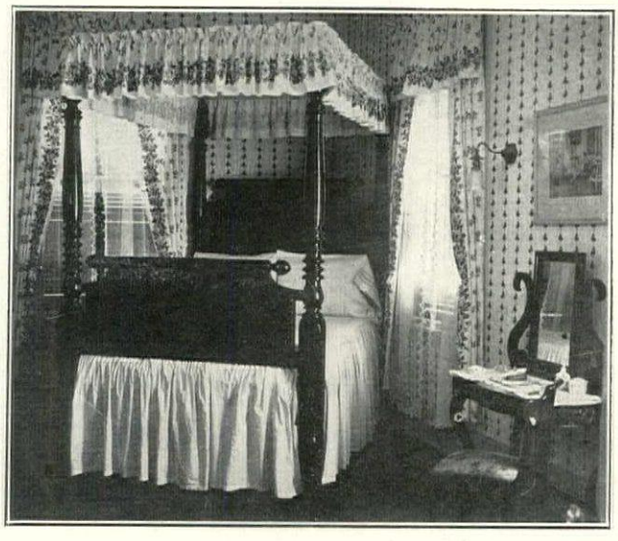
Fortunately the high point, which was but a brief moment of earth, was just in the proper place to support one side of the house, the other, to hold its level, had to send piers and arches of stone down some fifteen or twenty feet in search of terra firma. Thus the house has two feet on a hill, so to speak, and two feet in a hollow. From the front door one looks out along the driveway through the iron gateway to the street. From the terrace



THE VERANDA.

which opens out from the library and faces south one looks directly down on a small formal garden and then on over the beautiful lawn that rolls lower and lower to the very gulch itself, from which a precipitant terrace rises to the street above. Here the shadows are deep, and in the fragrant coolness of the trees the mocking-birds sing from early morn to the proverbial dewy eve. Such a chorus of mocking-birds was never heard elsewhere. They nest and brood in the great trees, and when it happens (if ever) that the home-grown chorus is insufficient it is supplemented by youngsters from the wildwoods all around.

"Woodlawn" has been built and settled just long enough for the English ivy and Virginia creeper to grow. The house was designed by Mr. A. L. Norrman after suggestions supplied by the owners. It is of frame, with the usual clapboards, built on a foundation of gray stone (quarried nearby) and with little enrichment other than that afforded by the colonnade of Corinthian

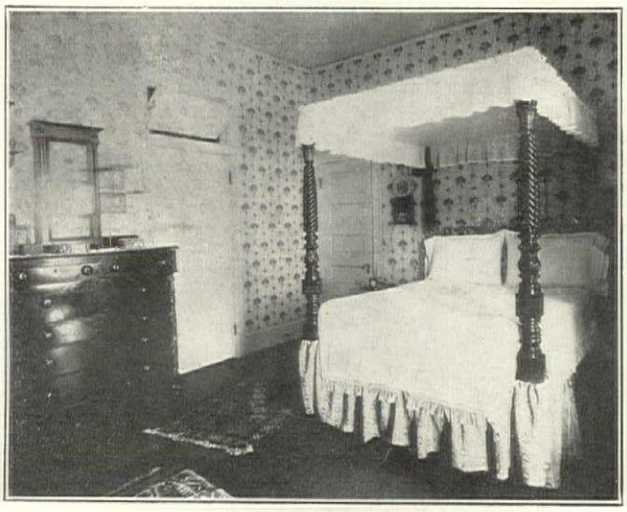


THE GUEST-CHAMBER.

columns and the turned balustrades. On the north side of the house the colonnade leads past the front door to the porte cochère, the only feature visible from the gateway. On the south side it ends in an open terrace which in turn leads into a screened veranda which in effect is little more than an extension of the dining-room. The screened veranda becomes in the South a kind of open-air parlor, furnished as a room with chairs, swings, tables

and growing plants, for general use when light in the less sheltered out-door spaces is too glaring.

The interior of "Woodlawn" offers no particularly original features, though the house was planned for both comfort and beauty—a duality not always realized. There is first a reception-room, then a library with the usual enrichment of bookcases well filled. This opens into the dining-room. The feature of the hall-



A BEDROOM.

way is an exaggerated brick mantel and fireplace with windows let in the solid masonry on either side. The bedrooms are all comparatively small, with low ceilings, the feature of each being a mantel of red brick laid up in white mortar. On the south side of the house are the family bedrooms, each with its separate bath. To the north are the guest-chambers. The house is furnished throughout with a taste that suggests a catholic interest in the beautiful. Some excellent old mahogany is to be seen. An example of this is given in two fine old beds shown. The four-poster in the guest-chamber was probably the work of some southern cabinet-maker about 1820 or 40—say at Charleston, New Orleans or Richmond. The bed shown in the other chamber is evidently of late English origin.

Back of the Woodlawn residence are the stables, the garage and the greenhouses. The latter stretch off row after row of long low glass buildings filled with roses, carnations and other exotics, all of which are brought to the highest perfection. In the tiny formal garden to the south of the house nature is left pretty much to herself, guided by loving hands. Unfortunately, when the photograph here shown was taken the spring roses had just finished blooming, else a froth and foam of white flowers would have been shown against the background of dark leaves.

C. R. S. Horton.

COMMUNICATIONS

SUBSTANTIAL PERFORMANCE.

New York, August 14, 1906.

To the Editors of the American Architect.

Dear Sirs:—In reading the opinion of the Appellate Division of the Supreme Court, in the case of New York *vs.* Horgan & Slattery, I was struck by a statement made by Mr. Justice Houghton, and adopted by the majority of the Court, of the "proper and salutary rule," that:

"An architect employed to furnish plans and specifications for the erection of a building is entitled to remuneration therefor, if they are made in accordance with the direction of the owner. He cannot recover, however, where the owner stipulates that the plans and specifications shall be for a building not to cost over a specified amount, if the plans and specifications made are for a building substantially exceeding that sum."

I have also been interested in your editorial comment; but I feel, however, that the opinion, as well as your comment, loses sight of a very important point—so important that I trust that in the re-trial of this case it will be brought prominently forward.

It is just that "the architect cannot recover where the owner stipulates that the plans and specifications shall be for a building not to cost over a specified amount, if the plans and specifications made are for a building substantially exceeding that sum," if the owner has not at the same time stipulated, with equal finality, that the building must be of a certain size, of a certain material, and must embody certain definite functions. But I think I may safely say, in at least fifty per cent. of the cases (and the sequel proves that it was so in this case), that the requirements laid down by the owner are such that no building can be properly designed (and the use of the word "properly" must rightly take into consideration all of the elements of safety, adequacy and dignity appropriate to its object) within the sum laid down by the owners. Indeed, every architect is familiar with the fact that it is the usual custom among the officials of the city of New York to make what is practically a guess at the appropriation needed for a building—or, at the best, an estimate based upon an incomplete study of the requirements and conditions—and then to instruct the architect what there must be in the building, for the first time developing all of the multiform requirements, and directs him to prepare plans and specifications in accordance with the said directions, and then to await the receiving of the bids; not with a view of then determining what modifications, if any, shall be made in the plan, but rather how it may then be possible to obtain the necessary additional appropriation.

Corporations and individuals seem often lacking in the simplest of common sense in the consideration of this feature of the architectural problem. There are but two positions which may be taken in connection with any building enterprise: either to build in accordance with certain definite requirements and provide the necessary appropriation therefor, or else to build within the appropriation and to limit the requirements to correspond. This does not mean that there are not architects prone to unnecessary elaboration or extravagance, which produces with the minimum requirements something more than the minimum cost; but it is an axiom that, with fixed requirements, there must always be a fixed minimum cost.

Yours very truly,

Electus D. Litchfield.

[We think that, in his turn, our correspondent "loses sight of an important point." While no man should be blamed for not accomplishing the impossible, he who knowingly and voluntarily undertakes the impossible may fairly be held blameworthy in his failure and deserves to suffer the consequences of his own rashness. Although it seems harsh, we believe the courts are right in holding that it is an integral part of the "professional skill and knowledge" for which the client pays, to be able to predetermine with satisfactory accuracy whether the client's stated conditions are or are not impracticable within the conceded allowable margin of variation. The inevitably aleatory nature of all dealings between architect and client is sufficiently acknowledged and provided for under the doctrine of "substantial performance." All that an architect need do for self-protection in the case where a client propounds impossible or extremely unpromising conditions is to declare, in writing, his belief that the problem cannot be solved as stated; that he is, however, willing to attempt the solution, but that, successful or unsuccessful, he must be paid for his skilled labor on such or such basis. —Eds. American Architect.]

CONCENTRIC BOULEVARDS.

To the Editors of the American Architect.

Dear Sirs:—The catastrophe which has befallen San Francisco will have aroused the sympathy of the whole civilized world, and the loss of so many great buildings will be deplored, whatever may be individual opinion upon the æsthetic merit of the various styles adopted.

I understand from statements in our building journals that a plan for re-alignment and improvements of the city, which Mr. Burnham was instructed to prepare, had been under consideration, and that it introduced the feature of a circuit boulevard around the city, a feature lacking to most, if not all, American cities, and no doubt suggested by those of Paris.

We, citizens of London, are suffering from congested streets, and the recent Royal Commission having failed to make suggestions for this wise arrangement, I have been urging it upon the attention of the professional institutes and brother professionals in regard to our case. The expense of acquiring necessary property of course runs into many millions, and we move slowly in the old country; but you have now, in ruined San Francisco, an opportunity of arranging these circular routes with radial avenues

intersecting, and then square blocks in the sectors so formed. I should like to be permitted to suggest that more than one circuit route is most desirable, and that several concentric boulevards would prevent the spread of fire, cause improved hygienic conditions by circulation of ozone, and that the conformation of the ground seems particularly to lend itself to an arrangement conducive to convenience and beauty. Trusting I may be excused for intruding with my views, I am

Yours cordially,

E. W. HUDSON, A. R. I. B. A.

76 Fellows Road, London, N. W.

ILLUSTRATIONS

BRANCH PUBLIC BATH, WEST SIXTIETH STREET, NEW YORK, N. Y. MESSRS. WERNER & WINDOLPH, ARCHITECTS, NEW YORK, N. Y.
FRONT ELEVATION AND CROSS SECTION OF THE SAME.
LONGITUDINAL SECTION OF THE SAME.
PLANS OF THE SAME.
DETAILS OF THE SAME.
HOUSE OF MRS. H. P. KING, PRIDE'S CROSSING, MASS. MR. JOHN LAVALLE, ARCHITECT, BOSTON, MASS.
ENTRANCE TO THE SAME.
ENTRANCE HALL: HOUSE OF M. NEWBORG, ESQ., 52 EAST FIFTIETH STREET, NEW YORK, N. Y. MR. J. F. FREEDLANDER, ARCHITECT, NEW YORK, N. Y.

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FISH MARKET, LEYDEN, HOLLAND.

NOTES AND CLIPPINGS

ALIGHT FOR ONE HUNDRED YEARS.—On the premises of a brick-making firm situat on the Surrey Canal, North Camberwell, the kiln fire has never been permitted to go out since it was first set alight 100 years ago. During all that time it has been subject to the heaviest rainfalls. It consists of only a few feet deep of lime and coke, which has been constantly renewed.—*London Chronicle.*

WHERE TIME HAS STOOD STILL.—One of the most interesting edifices within half an hour's ride of London figured in a case heard in a consistory court held at St. Paul's this week. This is Perivale Church, a tiny fourteenth century building, with a wooden tower, standing on a picturesque wooded knoll close to the Brent, near Ealing. Perivale is the smallest parish in the diocese of London, having but five houses and some forty inhabitants. Apparently the population has remained stationary since the Conquest, for the Domesday survey returns it as consisting of two land-holders, two cottagers, a slave, and their respective families.—*British Architect.*

CASTS OF EQUESTRIAN STATUES.—Full-size casts of the statues of Bartolommeo Colleoni and Gattamelata, the two greatest equestrian monuments of the Renaissance, are being mounted in the large hall of casts. The Colleoni is already in place, and the Gattamelata will soon follow. They are to stand on opposite sides of the hall, in such a position with relation to each other that they may be easily compared, and at a considerable elevation, the height of the pedestals being 10 feet 6 inches. The pedestals of the original statues are so high, and so obviously intended for outdoor effect, with large space about them, that it would be impracticable to attempt to reproduce them here, and therefore simple pedestals of Renaissance style are being provided. Both casts are included in the John Taylor Johnston Memorial Collection, the Gattamelata having been received in 1893, and the Colleoni this year.—*Bulletin of the Metropolitan Museum of Art.*

THE EXPIATORY CHURCH OF THE RESURRECTION, ST. PETERSBURG.—On the spot in St. Petersburg where Czar Alexander II. of Russia was assassinated in 1881, there is being built a remarkable church called the "Church of the Resurrection." It is constructed of chocolate-colored brick, trimmed with white marble, and is crowned with seven towers, covered with vari-colored mosaics. In these mosaics are represented scenes from the life of Christ, and there are a number of panels containing the coats of arms of the fifty Russian provinces and of the Romanoff family, with effigies of the apostles and the saints. In splendor and design this mosaic-work is declared to be unsurpassed. During the last twenty years the church has been in process of construction, and it will not be completed for twelve years more. While modern materials are used, the architecture is of the orthodox ecclesiastical style of the Middle Ages. Public contributions are paying for the work, the total amount collected aggregating nearly $6,000,000 from all parts of the empire.—*Boston Transcript.*

THE ARCHITECT AND THE DECORATORS OF THE SORBONNE.—"At the time when the Sorbonne was building," said M. Nénot at the late Congress of Architects, while reading his paper on the control architects should have over artists associated in their work, "a great fresco of twenty-six metres had been decided upon for the great amphitheatre, to decorate the part at the bottom which supports the cupola. The success depended on the tone of this fresco. Puvis de Chavannes seemed to be the right man. With him the white stone wall, almost entirely covered over, would continue to bear its cupola. But my friend, Benjamin-Constant, appointed for another decoration in the same monument, wished to be appointed to carry out this fresco, and the President of the Republic, M. Grévy, informed the Director of the Fine Arts, M. Kempfen, that he wished very much that he should be given the work. The position of the architect was painful. To resist the head of the State was a difficult matter, but, on the other hand, with the powerful palette of Benjamin-Constant the semi-cupola would no longer be supported, and the general harmony would be destroyed. I declared that if I was forced to accept Benjamin-Constant I should give up the fresco and substitute an architectural motive for it. Then I was allowed to have Puvis de Chavannes.

"This should always be the case; instead of the architect having a certain artist forced on him, he should be given a great freedom in the choice of his collaborators, and he himself must point out the artists and follow their work, without any other preoccupation than the general harmony of his work; and he should leave to the painters and sculptors, who are responsible for their work, every liberty of form or of color, provided they do not prejudice that general harmony without which no architectural work can really exist."

FONTEVRAULT AND THE ROYAL TOMBS.—The tombs at Fontevrault of our first two Plantagenet Kings remind us of the time when a Count of Anjou inherited England and Normandy from his mother, together with Anjou, Touraine, and Maine from his father, and was, in right of his wife, lord of Guienne, Auvergne, and other fair provinces in western and southwestern France. The project is revived of transporting to this country the monuments of Henry II. and his consort Eleanor, Countess of Poitou and Aquitaine, of Richard I., and of Isabella of Angoulême, second wife of King John. The Revolutionists rifled the graves of the Angevin princes in the abbey-church burial-ground; the mutilated effigies were subsequently removed into the south transept, and by the care some years ago of M. Félix Bodin, the historian, were protected from further injury. The four recumbent and crowned figures are considered to be portraits, and retain traces of coloring. Henry II. and Richard I. wear royal robes, without armor, as in the case of the effigies of King John and Henry III. at Worcester and Westminster; the figure of Cœur-de-Lion is of heroic size. Several members of the house of Anjou were buried within the precincts of the Abbey, which the Breton peasant and crusader, Robert d'Arbrissel, founded in 1099 as an oratory in the valley of the Fons Ebraldi, near Montsoreau, on the borders of Touraine and Anjou. The abbess presided over a community of nuns and monks, who in 1459 exchanged their Benedictine rule for that of Augustine. The post of superior was always conferred upon one of the blood-royal; the last abbess, Mme. Pardaillan d'Antin, a niece of Mme. de Montespan, enjoyed in 1789 an income of 100,000 livres. Despite certain scandals Fontevrault became one of the richest and most important religious houses in France, and had numerous branch convents. Of its five churches the greatest yet remains, having been built, or rather begun, in 1125 by Foulques, fifth Count of Anjou. The church has an eastern apse with apsidal chapels, and presents an example of spherical vaulting. The nave has been partitioned off and converted into a dormitory, on two floors, of the Maison Centrale de Détention for some 2,000 prisoners. In the second court of the abbey is the curious XIIth century Tour d'Evrault, of which the middle stage is square and the lower and upper stages are octagonal on plan.—*The Builder.*

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SOCIETIES, PERSONAL MENTION, ETC.

ALTHOUGH the aggregate of salaries paid by the National Government is enormous, it is a fact that the individual responsible official is notoriously underpaid. From the Supreme Court down through the Cabinet, the Senate, the House, to the Departmental bureaus there is hardly a place that is filled save at a direct pecuniary sacrifice to the holder, a loss which, to be sure, theoretically is balanced by the chance to acquire a name and fame that may be of greater profit later, on retirement to private life. But there are many who remain permanently in public life, and it is cause for deepest gratulation that so many of them are finally found to die poor men, in spite of the temptation to feather their own nests, as can so easily be done through the practice of "honest graft," as it has been called; that is, by making commercial use of inside information although not allowing one's official conduct to be swayed by personal money-making considerations. Of all these underpaid officials, probably the "best bargain" for the Government is found in the person of the present Supervising Architect, who must smile rather grimly when he compares his forty-five-hundred-dollar salary with the real worth of his service, as measured by the standard of private practice, and notes that his income is a tenth of what it might be. Familiar with the vast possibilities for graft, both honest and dishonest, that inhere in all Government building undertakings in the way of commissions, and "rake-offs" on contracts, and real-estate speculations perceived during the selection of sites, the Keep investigating-commission, a year ago, may naturally have been supposed to approach the Supervising Architect's office with a very avid curiosity. That, through and because of its examination, the country was not obliged to face the uncovering of a scandalous situation, may be taken as proving that no such condition existed and is far from being the smallest plume in Mr. Taylor's bonnet.

THE matter is a delicate one, but conducted as successfully and satisfactorily—both to the public and to the profession—as the Supervising Architect's office has been during the term of the present incumbent, it must be recognized that that hard-worked official is, like many others, grossly underpaid. Yet, if a salary commensurate with the work and the responsibility, and comparing reasonably with the income that would in private practice be derived from a similar amount of work, should be assigned to this official, his office would at once become one of the largest of the political "plums" the Administration has to give away, and, consequently, the objective of political adventurers of the most undesirable type. It graft, of both kinds, is likely to be excluded, then the very meager salary attached to the berth assures political adventurers that there is "not enough in it" for them, just as it warns away the highly capable, but needy, "leaders" of the profession, who realize they can make more money in private practice. The man whose skill would be amply paid for with the present salary is the very man to whom the Government building should not be entrusted, since he could not maintain and certainly could not better the present standard of performance. The office under the present scale of compensation has attractions, first, for the "cheap" and incapable man, to whom the salary seems even large, the very man who should not have it, that is; second, for the young and untried man, who may at bottom be qualified to do good work eventually, but who should not, simply because he is young and untried, have this important trust; third, for the tried and capable man who can, with difficulty, be persuaded to sacrifice a good deal for the sake of name and fame, and lastly, for the architect of independent means, good artist or poor one, who is willing to do the work because of his love of art or pride of country. The present situation is particularly unfair because, while a large part of the clerical and draughting force in the office have been brought under the Civil Service rules, the Supervising Architect himself has not, we believe, this protection. If the present standard of efficiency and output is to be maintained, the salary could with propriety be trebled: in common justice and decency, it should at least be doubled.

IT will be interesting to learn what unfavorable hygienic conditions are going to be developed by the operation of the great freight subway-system in Chicago that was opened to traffic July 1. The trouble arising from generated heat will not be as great as in the New York subways, since there are not present the many lamps in the brilliantly lighted passenger-cars and the animal heat arising from the bodies of millions of passengers to contend with. But, on the other hand, the inevitable dirt and litter at each of the independent shipping-stations, whether public or private, are likely, in spite of careful policing, to get into the main tunnels and there be driven back and forth by passing trains until reduced to dust and in that form sucked upward into stores and buildings, thus disseminating broadcast germs of filth diseases that may have been engendered in the tunnel by the careless personal habits of employés, working out of sight of supervision and indifferent to the obligations of common decency. If the matter of fire-doors and hydrants at each

Entered at the Post-Office at New York as second-class matter.

private opening into the tunnel has not received the anxious attention of underwriters, architects and building-owners, an accident in the tunnel with its inevitable fire caused by short-circuiting of electric current might easily lead to a serious and widely distributed conflagration in buildings on the surface. Doubtless, the obvious proper regulations for the exclusion of dangerous freight have been adopted by the operating company, but what is to prevent, with the desirable absolute certainty, a "dust-explosion" of appalling magnitude, in case a carload of innocent flour, in consequence of a collision, fills the tube with impalpable dust just in front, say, of the entrance to a large department-store, and ignited by the first flash of the short circuit?

HARVARD UNIVERSITY announces the opening this fall of its new School of Applied Science, a step which is made possible through the immediate availability of two million dollars, the first installment of the bequest of the late Gordon McKay. The new department opens as a "graduate school" and so does not come into competition with the University's long-established school of science, the Lawrence Scientific School; and for the same reason its establishment is likely to do the smallest possible amount of damage to the Massachusetts Institute of Technology in Boston. But it is difficult not to believe that, eventually, the well-equipped schools in Cambridge will operate to the disadvantage of the excellent school in Boston. It is regrettable that respect for the letter of the law and the sensitive *amour propre* of the Technology alumni stood in the way of a coalition between the two agencies of higher education in the applied sciences.

LOCAL talent, always appreciative of its own merits, announces that it has been severely snubbed in the matter of the new library building which the State of Connecticut is to build in Hartford. The committee having charge of the matter has decided to hold a small limited competition between five contestants, and, instead of pandering to State pride, has invited three New York architects and only two Connecticut architects to submit competitive designs. The curious feature is, not that the local architects should be in the minority, but that each of the two Connecticut men, on receiving his invitation, at once entered into "association," for this competition, with the best New York architect he could discover outside of the three already invited by the Committee. In this case local talent would seem to have committed hara-kiri, so far as its own reputation is concerned, although it is entirely probable that one or the other of the associated architects may enter the successful design. But, if so, it will always be disagreeably indeterminate whether the meed was won by foreign or by local skill.

SO far as we can understand the accounts in the Norfolk, Va., daily papers, the lawyers who are conducting the suit of Messrs. Parker & Thomas, architects, of Boston, against the National Bank of Commerce and Commercial Realty Corporation, entertain rather unusual views as to what it is that architects imagine their clients should pay them for. The first of the seven heads in the declaration prepared by the plaintiffs' lawyers declares that suit is brought for "goods bargained and sold by the plaintiffs to the defendants." The second, that it is for "work done and materials provided by the plaintiffs for the defendants, at their request." The third, that it is for "money lent by the plaintiffs to the defendants," and so on, "money" being referred to in three other counts. But nowhere does it appear that the claim rests upon the exercise of professional knowledge and skill. The lawyers and perhaps their clients appear to be sternly materialistic and not at all sentimental. How it happens that architects have been lending money to their clients, unless in the shape of car-fares on some inspection trip, we cannot imagine. One thing appears plain from the language of this declaration: the architects can have no intention to set up a plea of ownership in the drawings made by them, since these obviously must have been amongst the "goods bargained and sold" by them. The architects sue for some six thousand dollars' balance unpaid, a claim to which the defendants demur on the ground that the building was delivered to their hands two hundred days later than the date named in the contract.

IF the pervasive English sparrow has reached Michigan, a new indictment can properly be laid against the little pest, while another is brought against the contractor who erected the waterworks stand-pipe at Three Oaks, in that State, for not having closed the top of the pipe with the cover, or netting, called for by the specification. Alarmed by an outbreak of typhoid-fever in the town, the authorities naturally investigated the water-supply, and when they reached the top of the stand-pipe discovered, as the report reads, "the dead bodies of several thousand young sparrows in various stages of decomposition covering the surface of the water." Large numbers of parent birds had nested on a ledge surrounding the inside of the pipe, and then, as the young ones chanced to die in the nest, simply scratched the bodies overboard into the town's drinking-water; and the supply of avian cadavers was kept up by the fall of fledglings, whose pinions were too weak to carry them across the gulf, and the victims of the perpetual domestic and tribal feuds. The twenty-one persons now struggling with typhoid-fever in this little town, that numbers only a thousand inhabitants, have very good ground for suing the forgetful contractor for damages.

THE rumored overwhelming and disappearance of the Island of Juan Fernandez during the seismic convulsions which on August 16 wrecked Valparaiso, Santiago and other Chilian towns not only recalls to everyone Robinson Crusoe, but reminds us of De Foe's vivid treatment of that earlier cataclysmic disaster in the pages of *"The Journal of the Plague Year,"* and causes regret that the old romancer's mantle has not in these upheaving times fallen upon some newspaper writer who can set before us in convincing fashion the scenes he unquestionably has witnessed. Some weeks will have to pass before it is possible to compare or contrast the seemingly identical mishaps that have befallen the maritime metropolises on the Pacific coast of the northern and southern continents, misfortunes of relatively equal magnitude.

THE USE OF BURNED CLAY PRODUCTS IN THE FIREPROOFING OF BUILDINGS.[1]—I.

IT is proposed in this paper to treat of the actual use of burned clay in building construction as employed in the United States of America in the erection of fireproof buildings. In nearly every country on the face of the earth clays of various qualities may be obtained, and burned clay is the most ancient of building materials, so far as the remains of the earliest examples of architecture that have yet been discovered have revealed to us. Stone may have been used earlier, but if so, no remains of wrought stone have been discovered which antedate brick. Natural clays vary in hardness and fire-resisting qualities, from the soft clays which can only be burned to the consistency of a porous flower-pot to the refractory clays which resist a temperature of nearly 4,000 degrees F. in the open-hearth furnace. Nothing else will stand the latter test. Hence it is within the reach of anyone who can get the right kind of clay, to employ a fire-resisting material of higher efficiency than any other known substance.

In this connection it may be stated that in practical use it has been found that no two clays are exactly the same, and therefore no standard of efficiency can be established unless one peculiar to each country or locality. The ascertainment of the highest efficiency in any country, therefore, must be the result of tests and experiments. But a general classification of clays may be made everywhere. It concerns us, however, to consider only the use of refractory clays, which in their turn, even, have different degrees of efficiency. It is not, therefore, assumed that the proper clays have always been used in fire-resisting constructions. The commercial factor enters very strongly into the fireproofing problem, and it must be admitted that there have been failures in the use of clays for fireproofing purposes because unsuitable ones have been used in the manufacture of material, where better ones could have been procured. It is mainly a question of paying for the best, and using it judiciously. Proper clays have been used and have stood the test of destructive fires. And, what is more, the best of clays are never so costly or so difficult of fabrication that their use is in any sense prohibitive.

Burned fire-clay is only a medium non-conductor of heat. But it can be fabricated in cellular form admitting air-spaces, which are the best non-conductors, or its structure may be made porous by mixing combustible materials with it and eliminating them by the process of firing. In the latter condition it becomes one of the best non-conductors. Then again, both qualities may be obtained in the same piece. Different clays admit of different degrees of porosity in fabrication, but, as strength is an important element, it has recently been found that the best form of manufactured fire-clay, for fire-resisting purposes, is a semi-porous body made in cellular form, which has lightness and toughness to resist shock, as well as sufficient non-heat-conducting property to resist the action of heat in all possible exposures in burning buildings.

The extensive use of burned clay other than in the form of bricks, in the interior of buildings, in the United States, dates from about the year 1878. But it had been used in a few instances at earlier dates. Primitive forms of incombustible floor construction with iron beams were used as early as 1850. A brick arch was used to span the space between the beams, but gave no protection to the beams. Rolled I-beams were first used in 1855, and the filling of the floor was made also with brick arches. The first perfected flat arch of hollow bricks for spanning spaces between I-beams was made by Garcin, in France, in 1868. Similar flat hollow arches were used to a limited extent in New York, Chicago and St. Louis from 1873 to 1878, and at the same time hollow bricks for partitions were introduced.

It is hardly necessary for me to give a detailed account of the numerous inventions of this nature that were patented between 1870 and 1880. The records of the French, British and American Patent-Offices are full of them. A great impetus was given to the invention of forms of hollow bricks, and newly suggested uses, by the invention of the various kinds of clay presses for the manufacture of drain and sewer pipes by pressing the prepared clay through dies or mandrels. Most of them were impracticable, and very few were ever used, but the number of inventions was so great as to destroy the value of nearly all the patents taken out after this period. Hence, there are now very few fireproofing materials or processes in which burned clay is used that are covered by patents. At the present time the direct-action vertical sewer-pipe steam-press is the most important agent making the present extensive use of hollow burned clay products practicable and economical for building purposes.

It was during the experimental period above referred to that porous tiles were first made. A clay was mined at Brazil, Indiana, which had such great toughness that it was possible to mix equal quantities in bulk of clay and sawdust, so that after burning the weight was reduced 50 per cent., and still great strength retained. This was manufactured at Chicago, first for tiles 16 inches square and 2 inches thick, to be set between inverted T-irons for roof construction. They were covered by slates laid in cement and secured with wire nails driven into the tiles. These were first used in the roof of one of the pumping-houses of the Chicago Waterworks and the roof of the State Capitol Building at Des Moines, Iowa. The tiles were cast by hand in plaster moulds.

Porous terra-cotta tiles were first used by the writer in fireproofing the cast-iron stanchions of a building in Chicago, in 1873, and another in Milwaukee. The stanchions were cast with projecting webs, and gores of terra-cotta were set in cement between them, also covering the webs, and fastened to the iron by screws tapped into it. This method of protecting iron stanchions proved so effective in one building, not otherwise fireproof, which was badly damaged by fire, that the finished stanchions were taken out of the ruins with all the fireproofing attached. These gores were hand-made in plaster moulds. The stanchions in a large number of buildings were fireproofed in this manner between 1879 and 1885. They have been subjected to several fires and have never failed, but I have not seen them constructed for fifteen years past. During this time porous terra-cotta was manufactured for flat floor arches and partitions at factories near New York, being made hollow through mandrels on presses working horizontally. They were used for the new roof of the Patent Office at Washington, a part of which, of unprotected iron construction, had been destroyed by fire. About the same time the writer executed in porous terra-cotta the protection of all the roof trusses of the Chamber of Commerce at Milwaukee, covering every member and using mechanical fastenings, which had never before been done. When called upon, he also covered all the truss work and girders supporting the roof of the reconstructed Patent Office at Washington. Since those times porous terra-cotta has been made through dies or mandrels in various parts of the United States, for all purposes for which burned clay was required for fireproofing the interiors of buildings.

I regret to be obliged to say, however, that much of it that was made between 1885 and 1890, during a great demand for new buildings, was of very inferior quality, even red brick clay being used in some localities.

In referring to the use of porous terra-cotta for fireproofing purposes, as distinguished from construction purposes, I have somewhat anticipated the thread of my subject. I have not yet stated the reason for the extensive use of burned clay hollow and porous fireproofing materials after 1875, and especially after 1880. This was found in the discussions and investigations which followed the great fire at Chicago in 1871. Up to that time the incombustible systems of building, which had been the result of the introduction of rolled I-beams in France and Belgium in 1854, and in England and the United States in 1855, were thought by most architects to be sufficiently fireproof for practical purposes. Cast and rolled iron were used with brick for interior constructions, with indifference to the effects of heat upon iron. There had been few destructive fires in such buildings, until attention was attracted to the destruction of a cotton-mill at Oldham, in England. But the Chicago conflagration gave evidence everywhere of the unreliability of iron in a severe fire; for quite a number of incombustible buildings were destroyed and none were saved which had been directly exposed. Experiments in protecting iron construction with clay products slowly followed this revelation, and it was several years before they received recognition.

In 1880 there commenced at Chicago a building revival of great extent, which was followed in New York and other cities. There was a demand for buildings not only incombustible but fireproof, and a large number of buildings which had been erected in Chicago during the rebuilding after the fire, in great haste, were replaced by fireproof structures. In these, hollow and porous products were used almost exclusively for all the constructive parts which were not of iron, and for covering all the exposed iron of both kinds that had been employed. In 1888 the "steel skeleton" had been fully developed and called for a still greater care in its protection; for it had become the vital part of the new

[1] A paper by Peter B. Wight, F.A.I.A., Editor of "Fireproof Magazine," Chicago, U. S. A., presented at the International Congress of Architects, London.

construction, and cast-iron, before used for stanchions, had almost entirely gone out of use in such buildings. Steel was believed to have greater liability to distortion than cast-iron. This soon became the experience in all the other large cities.

But the erection of tall office-buildings, generally denominated "skyscrapers," of ten stories or more, had preceded the introduction of rolled steel, which dates from 1885. The first one was erected in 1881, and in it the two most serious questions of construction involved in buildings of this class began to find solution. At the bottom of all was the foundation question. This building was to be ten stories high. It had not been found safe before that time to place a weight of more than 4,000 pounds per superficial foot on the clay which underlies nearly the whole of the site of Chicago, or to excavate more than thirteen feet deep, where there was a crust somewhat harder than at any point below this depth. So, on account of the number of floors, the weight was such as to require an excessive spread of the footings. Messrs. Burnham & Root were the architects, and the writer was engaged as consulting-architect. The building was to be fireproof and all iron protected with burned clay. The problem of building very light floors had to be solved. Girders were so placed as to reduce the spans of I-beams to 18 and 16 feet, placed from 3 to 4 feet on centers, and a section of hollow-tile flat floor arch was devised, of which the net weight was only 25 pounds per superficial foot. It was made of a hard fire-clay with walls only one-half of an inch thick. No such light tiles had ever before been made, but they proved to be a great success so far as construction goes. They were tested up to 500 pounds to the superficial foot, but not to destruction, though intended to carry only 70 pounds. Knowing the full weight of the floors, the spread of the footings could now be ascertained. When the calculation had been made it was found that some of the foundation piers of bridge masnory, with safe allowances for offsets, would reach above the basement floor. The bottom course of the piers was to have been of concrete, 18 inches thick, on which it was intended to set back the first course of bridge masonry 12 inches. But if the tops of the piers were to be kept below the basement floor the offsets on the concrete must be increased to two or more feet. It was to prevent the possible shearing off of this offset that the writer introduced iron rails imbedded in the upper part of the concrete in two directions. This experiment is what led to the general use of so-called "grille" foundations, which ultimately were reduced to nothing but concrete and steel, very shallow, but sufficiently strong. Thus it will be seen how the hollow tile became a factor in solving the high-building question.

But now neither the light floor tile nor the "grille" foundations are necessary. Foundations of concrete piers, built in tub-like caissons with hoops on the inside, to a depth of 60 to 100 feet, have made us indifferent to great weight, and we are able to use floors of any weight that satisfy the demand for a fireproof construction that will resist the greatest conflagrations. The thin-walled hard tiles have been found to be insufficient for the purpose. They are required to have thick walls and round cornered in the cells, and in the best work are neither of hard tile nor porous tile, but of hollow tiles which are semi-porous, yet strong, tough and not subject to sudden expansion or contraction, or to damage by shock when struck by heavy falling bodies.

The Montauk Block is no more. It has been torn down, to be replaced by a still larger and higher building, in which are embodied all the improvements of twenty years in foundations, steel construction and semi-porous terra-cotta fireproofing. The First National Bank is its successor, a building many times larger and just ten times as costly, the architect of which is the head of the firm which designed the first building, Mr. Daniel H. Burnham.

* * * * * * * * * * * *

With this object-lesson illustrating only a few incidents in the development of fireproof building construction in the United States, we will now proceed to as brief a description as possible of the details of the systems now in use, leaving out all further mention of its early history.

All fireproofing with clay is now done with machine-made material, pressed through mandrels, and most of it is made in the vertical steam-press originally invented for making sewer-pipe. This has proved to be the most economical method of forming the tiles after the clay has been ground in dry pans and mixed in its proper proportions and tempered in wet pans. Hand-made porous terra-cotta is no longer used, on account of the expense. Hard hollow tiles, made without mixture of combustible ingredients, are no longer used for first-class work, on account of their brittleness and liability to expansion on exposed sides, the built-in parts being subject to less expansion in a fire. The two standard materials, therefore, are denominated "porous terra-cotta" and "semi-porous terra-cotta." All clays that are sufficiently refractory to be used in fireproof construction may be manufactured

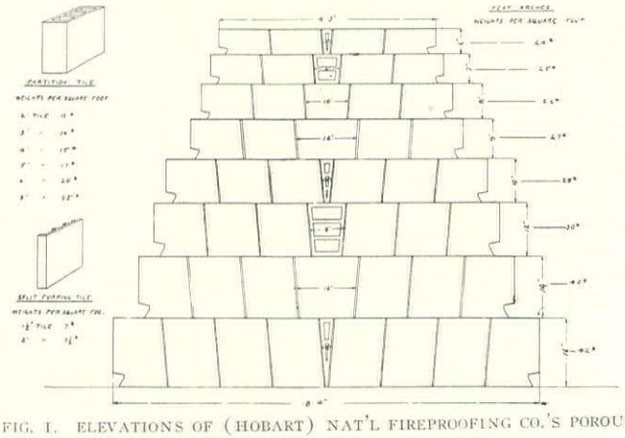

FIG. 1. ELEVATIONS OF (HOBART) NAT'L FIREPROOFING CO.'S POROUS TERRA-COTTA END-PRESSURE FLAT ARCHES.

into one or the other of these materials. There is a limit, however, to the thickness of the walls in tiles of porous terra-cotta, which is two inches, on account of the danger of the combustible

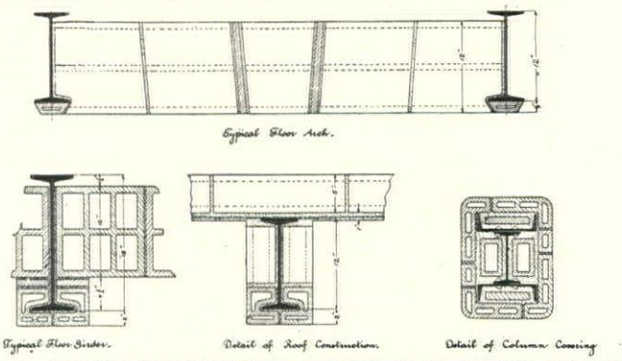

FIG. 2. END-PRESSURE FLAT ARCH, ALSO GIRDER, STANCHION AND ROOF FIREPROOFING: CADILLAC AUTOMOBILE FACTORY, DETROIT, MICH.

ingredients being only charred and not completely reduced to ash. If solid blocks are made thicker than this they must be run with frequent holes to facilitate uniform burning. The walls of a semi-

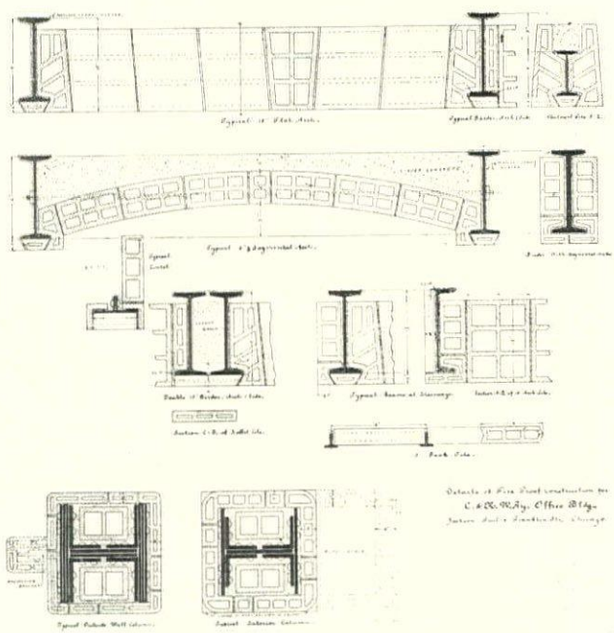

FIG. 3. END-PRESSURE FLAT ARCH WITH SIDE-PRESSURE SKEWBACK, ALSO SEGMENTAL SIDE-PRESSURE ARCH AND STANCHION-COVERING: C. & N. W. R. R. OFFICE-BUILDING, CHICAGO, ILL.

porous tile may not exceed one and one-half inches. The best practice is to make the walls of the semi-porous tile from three-quarters to one inch thick, and the porous tile from one inch to one and a half inches.

There are two classes of use for burned clay in fireproof-buildings; one when used constructively under pressure, and the other when used as a non-conducting and structure-protecting material. In the first case it must sustain strains and at the same time resist heat for its own protection, and in the other it acts only for the protection of the steel members of the building. It sometimes per-

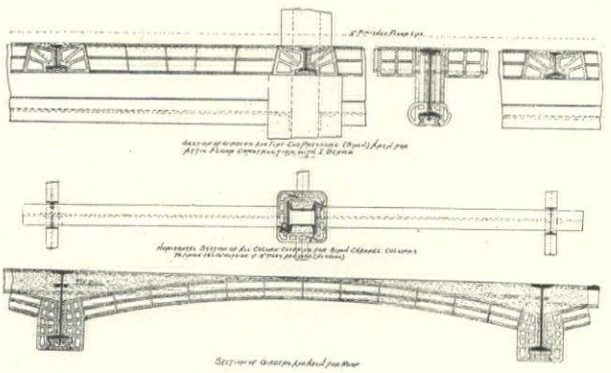

FIG. 4. SECTIONS OF END-PRESSURE, FLAT ROOF-ARCH AND GIRDER; ALSO END-PRESSURE SEGMENTAL ARCH. SAME ALSO SHOWS SECTION OF STANCHION-COVER CRAMPED WITH STEEL AND FILLED WITH CONCRETE. DESIGNED BY THE AUTHOR.

forms both offices, as in the case of floors and roofs; in others it is inert, as when used in protecting steel columns and girders.

* * * * * * * * * * * *

The principal uses of clay products for construction are in floors, roofs and partitions. For use in floors, I shall give only a few typical illustrations. Floors are arched between I-beams with either flat or segmental arches. Flat arches were formerly made with joints radiating from a common center. They are now made with all joints parallel to the sides of the key. Repeated tests have shown that both are equally strong, and that the mechanical action of a flat arch is that of a beam with fixed ends. The illustration here given (Fig. 1) is a diagram showing eight depths and minimum lengths of tiles used for flat arches with the weights of each per superficial foot. The lengths of these spans may be increased twenty-five per cent. for some classes of buildings. In the best practice the soffits of these arches when set are two inches below the beams and the tops are one inch below the tops of the beams, so that each arch shown on the diagram is for a beam one inch less in depth than the size figured on each. These are for "end-pressure" arches, that is, for those in which the cells run in the direction of the arch. In some of the arches keys are shown for illustration on the side-pressure principle, and such keys are generally used when required less than eight inches wide at the top, because they can be bedded more perfectly than if they were cut from the voussoir section of tile. The skewback tiles are cut out to fit the beams and hold the protecting soffit tiles. Soffit tiles are made two inches thick and the width of the flanges of the beams, with a hollow space of one-half inch in the center of each. They are set longitudinally with the beams. They are for the protection of the beam from heat, and, if the arch tiles are bedded perfectly, add greatly to the strength of the arch, as tests have demonstrated, in comparison with arches similarly set with-

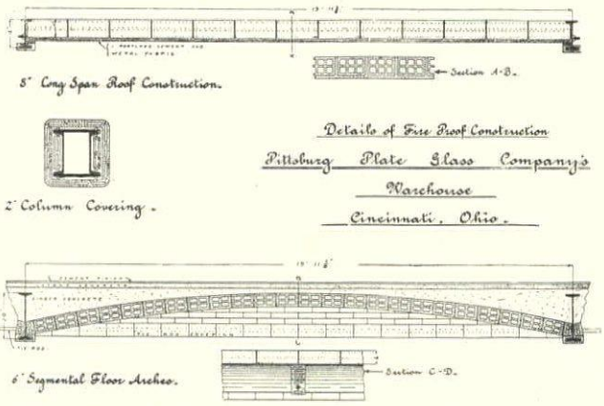

FIG. 6. SECTION OF LONG-SPAN SEGMENTAL SIDE-PRESSURE ARCH; ALSO LONG-SPAN ROOF-CONSTRUCTION, WITH STEEL TENSION (JOHNSON SYSTEM).

out soffit tiles. (See section across beams, Fig. 2 and also Fig. 3.)

The original flat arch was made on the "side-pressure" principle; that is, the hollow spaces in the tiles were parallel with the I-beams. But as the "end-pressure" arch was shown to have greater strength, the "side-pressure" arch is no longer used for standard work, and therefore will not be illustrated.

Segment arches in hollow tile are made both on the "side-pressure" and "end-pressure" principles. The greatly superior strength of this arch and its capacity for use in long spans does not militate against the use of "side-pressure" tiles. It has been found in practice that there is no necessity for breaking joints in the "end-pressure" arches, for in them the whole strength of the material is brought into play. But there is a certain advantage in breaking joints in long-span segmental arches; hence "side-pressure" tiles are preferably used. The illustration here given (Fig. 5) is a section of a segmental arch of 18 feet 6 inches span, used in the Brown Block, St. Louis, Missouri. This shows the method of covering the flanges of the beams and the form of the skewbacks. The cross section at *A B* through the crown of the arch shows how the tie-rod is protected by special tiles cramped together. On top of these protecting tiles partition-tiles are set in courses and fitted up close under the arch, thus dividing the ceiling into panels. Both flat and segmental arches are used for roofs as well as floors. (See also Figs. 3 and 6 for side-pressure segmental arch, and Fig. 4 for other details of flat and segmental arches.) (*To be continued.*)

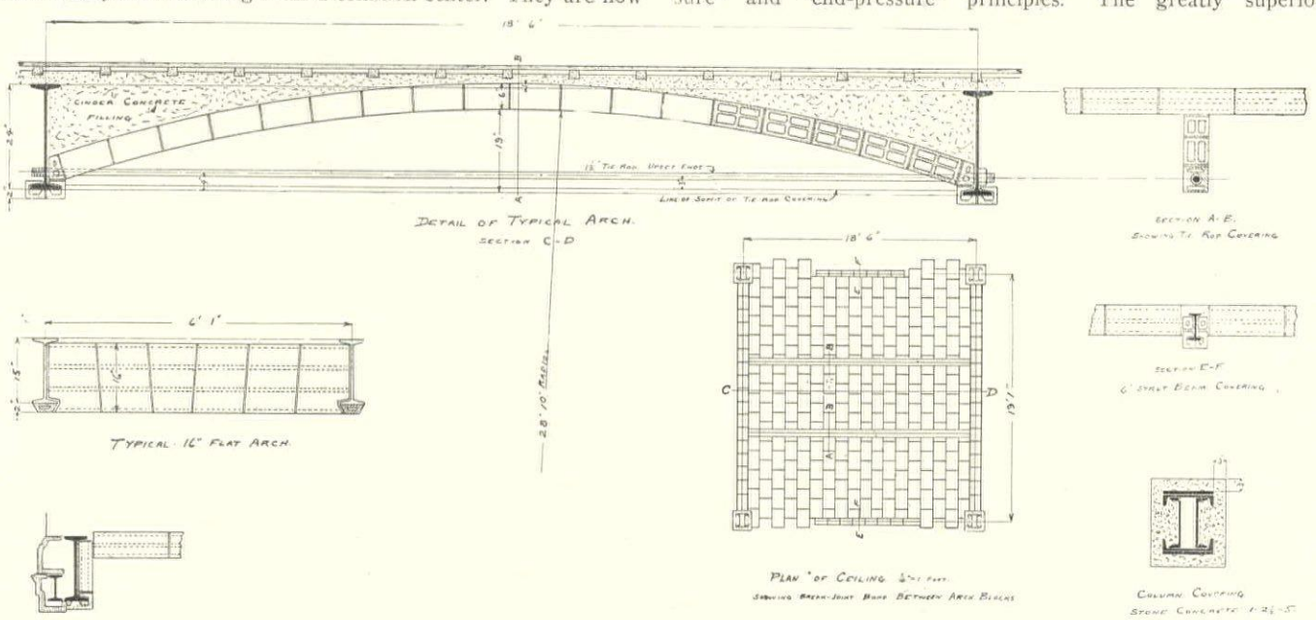

FIG. 5. SECTION OF LONG-SPAN END-PRESSURE SEGMENTAL ARCH, WITH DETAILS: BROWN BLOCK, ST. LOUIS, MO.

THE LIMITS OF FIRE INSURANCE.[1]

FIRE insurance in England, and all over the world, is based on the common-law principle of pure indemnity—the principle that no one shall, if he can be prevented, make a profit out of a fire, that he shall recover only the amount of his actual material loss, and that the burden of establishing the fact and the extent of his loss shall rest upon the person insured. The full severity of the common-law rule that no one is entitled to recover from an insurance company more than the actual amount of his proved loss is in practice tempered by concessions to genuine claimants, but it stands confronting any one who attempts trickery or extortion. It will be seen that this principle or rule of indemnity, quite apart from any special conditions inserted in insurance policies, involves important limitations. In the first place it disestablishes the "sum insured" from the lofty place which it occupies in a life or a marine insurance contract. In a fire-insurance policy the sum insured merely marks the maximum liability accepted by the insurance company and determines the premium to be paid; it is not in any way admitted by the insurance office as a measure of the value of the property insured. If I have a life policy for 5,000*l.* and I die, my heirs can, on proof of death and their title, receive over the counter 5,000*l.* at least, possibly more if there are any "bonuses." If I have a ship and I insure her at Lloyd's or with marine insurance companies for 5,000*l.* I can recover the full 5,000*l.* at once should my ship be totally lost. But if I insure my house against fire for 5,000*l.* I cannot recover 5,000*l.* unless it should happen that I can prove the house to be worth fully that sum. All that I am entitled to demand is the actual value of my house immediately before it was burned, and I must give every assistance to the insurance company in order that the actual value may be justly determined. By statute the insurance company has the power to reinstate that house (as far as the sum insured will go) instead of paying me anything, and third parties interested also have the right to call upon the insurance office to rebuild my house. In practice, compensation is usually agreed and paid in cash without recourse on either side to the right of reinstatement, but in no case am I entitled to more than the actual value of my house as it existed just before the fire. In other words, a life or accident policy is a contract to pay a definite sum in certain circumstances; a marine-insurance policy is a contract to insure certain property—ships or cargoes—of which the values are agreed at the outset; but a fire-insurance policy is a contract to indemnify the insured against such loss or damage as he may sustain, the extent of such loss or damage to be determined after a fire occurs. The chief reason for the important difference in principle between a marine and a fire policy springs from the difference in condition of property in transit and stationary property. Goods in transit are out of the control of the persons who effect the insurances upon them; goods in buildings on land are usually within that control. Then, again, the values of ships are readily determined by the published results of surveys (such as those of Lloyd's Register), while the values of buildings on land require separate and special surveys. Apart from the cost of such surveys, there is no particular reason why the values of buildings, at any rate, should not be determined when fire insurances are taken out, and adjusted from time to time to allow for alterations or depreciation. But the public demand for insurance at the lowest possible premium, and the companies' fear of the "moral hazard" of property entirely within the control of the persons insured, quickly led, early in the eighteenth century, to the adoption of the present system.

The limitations arising out of the principle of indemnity, increased as they are by specific policy conditions, are much more serious in the case of the contents of buildings than in that of the buildings themselves. A building cannot be removed, so that the fact of loss is obvious and needs little proof, and its value is not difficult to settle even though it be totally destroyed. But contents are readily removed, and, in the absence of records, their true value is by no means easy to establish. Business firms which keep an exact account of their stock and its cost are in a different position, after a fire, from a private householder who has no inventory of his furniture and other property and, possibly, has not even the original bills. The burden of proving a loss rests on the claimant, and the disputes, which sometimes inevitably arise, are almost always due to the inability of the claimant to produce reasonable proof of loss. If householders would have an independent inventory made, say when they take and furnish a house, or subsequently if they like, and keep a careful record of all additions (with their cost) and also of all removals, they would then be able to produce trustworthy evidence should they suffer from a fire. The cost and trouble expended in these precautions would be more than repaid by the ease and completeness of the insurance settlement. There is a story that a man once claimed for the loss of 150 pairs of trousers, and when the number was struck out as preposterous he so bestirred himself in the collection of bills that he proved the loss and drew the compensation for no less than 280 pairs! There may, therefore, be solid advantages in preserving even old tailors' bills.

Let me repeat that insurance offices are liable only for the actual value of the goods destroyed or damaged; not the value when new, but at the time immediately before the fire. Evidence of first cost, while most useful in the case of furniture and other goods which more or less regularly depreciate in value, is of little weight in the assessment of loss or damage to pictures, curios, jewelry, and so on. Here the market value is highly variable and depends rather on current taste than on anything commercially assessable. Money and securities, except while in transit, are not insurable on any terms, and valuables such as those mentioned are not covered by an ordinary fire policy. They must be specially insured, and no kind of insurance seems to me satisfactory to the owners which does not fix the values in advance. Suppose a man pays 3,000*l.* for a Constable at the top of a "boom" in this painter. If he loses this picture from fire he wants his outlay, at least, to be restored, and not be left to depend for compensation upon the fashion in Constables at the moment of the fire. Arrangements can be made for the insurance of pictures, jewelry, curios, china, and so on, on the principle of fixed values, not of indemnity, and a large amount of business is done in this way, though some of the orthodox fire-offices will not accept it. Experience does not show that the "moral hazard" is at all incalculable—the risks of fraud are not great if ordinary prudent regard is shown to the position of the people insuring, and these risks, such as they are, are allowed for in the premium charged. All the pictures, relics, etc., exhibited at St. Louis or Milan, or temporarily placed in loan-collections, are insured on the principle of fixed values.

A fire-insurance policy is not only a contract of indemnity; it is also a personal contract. It is not an insurance on a building or on goods, but an indemnity to the person who insures the building or goods, and then only to the extent of what is called his "insurable interest." The doctrine that no one can effect a valid insurance on any property except to the extent of his genuine pecuniary interest in that property is common to all insurances, though marine underwriters and companies largely ignore it in practice. Marine policies covering a shipowner's hypothetical "loss of freight," and so on, in which proof of actual interest is waived, are common, but anything of the sort is practically unknown in fire insurance. Here the air is much more serene and legally purified. As the person who effects the fire insurance must have a definite insurable interest, it follows that he cannot insure any property unless it belongs to him or he is legally responsible for it, or he is interested in some other way—say as mortgagee.

I have already shown how the fire-insurance policy is a contract of personal indemnity, and I must now carry it a step farther, and deal with limitations of place and circumstance. A building, say, is in use for a particular purpose and is equipped in a particular way. The owner takes out a fire-insurance policy at an agreed rate of premium. Now, as that premium is based on the degree of fire-risk incident to the particular building while in its present use, it is obvious that anything done to increase that risk, either by change in construction or in use, may invalidate the contract altogether. It follows that any change in construction or in use, just as in ownership or interest, must be immediately notified to the insurance office. It should be broadly understood that it is the business of insurance offices to insure, and that they desire for their own benefit to meet the convenience of their clients. In order that there may be unbroken harmony between the two parties to the contract, the person insured and the office, there should be the fullest good faith. It is far better to tell an insurance office too much than too little, both at the outset and during the currency of the policy. . . .

As in the matter of insurable interest, insurances on domestic furniture and other property in private houses are specially treated in regard to the right of removal. It is not necessary for a householder specially to insure his luggage when he goes for a holiday. Since the autumn of 1903 all fire-insurance policies have contained a clause allowing the removal of articles of household or personal use or ornament to any other private dwelling-house.

[1] Extracts from a paper by Mr. F. Harcourt Kitchin, in The Nineteenth Century.

club, lodging-house, or hotel in the United Kingdom where the insured may be staying, or to any bank or safe-deposit which is not part of a furniture depository. Property so removed will be held covered to the extent of 10 per cent. of the amount insured by the policy. In a similar way the contents of a coach-house, stabling, or harness-room may be temporarily removed to any other place of the same description in the United Kingdom and will be covered while so removed. I am referring, of course, to ordinary fire insurance, and not to the numerous special contracts which may be taken out covering accidents from all sorts of causes to horses, carriages, motor-cars, etc. . . .

No fire-insurance policies issued in Great Britain, and in most other countries, cover loss or damage caused by or happening through riots or civil commotions, foreign enemy, military or usurped power, or earthquakes. If such a disaster as that of San Francisco occurred here the fire-offices would have no liability either for earthquake or for fire damage caused by the earthquake. The reason for this large exclusion is the incalculable nature of an earthquake and the damage which it may cause. Not only can no one calculate a premium to meet so vague a risk, but no human security can be provided which would not be scattered to fragments by a really widespread earthquake. We have seen the enormous fire-losses—amounting to not less than 40,000,000*l.*—arising out of earthquake in one American city. If the shock had spread far to several other important cities, as it might well have done, probably no fire-insurance office, British, American, or European, would have been able to pay the claims upon it. The protection offered by fire insurance is an indemnity against ordinary accidental losses, and not one of the exclusions with which I am dealing is of the nature of an ordinary accident. Fire-losses arising out of riots and civil commotions are ruled out practically everywhere. It is a liability of a State or municipality to protect its citizens from the effects of wide outbreaks of disorder, and, in this country, I believe, property-owners, in the event of loss through riots, have a remedy against the public authority which controls the police. If a country be invaded by an enemy, or a revolution takes place, the destruction might be stupendous—comparable even to that caused by an earthquake—and there would be no security that fire-offices could pay, even if they did not exclude the risks altogether. They properly exclude these risks. There is yet another exclusion applicable to some insurances—namely, damage caused by spontaneous combustion or heating. This is a very limited exclusion, since it relates only to the damage caused to the object which heats, and not to the damage caused to other property by a fire originally due to spontaneous combustion. Suppose there were a dozen haystacks and one heated, and that in consequence the whole batch was destroyed by fire. Then the loss on the original offending haystack which heated would be excluded, but the loss on all the other eleven innocent haystacks would be paid for by the insurance offices. . . .

While there is some justice in the criticism that the orthodox system of fire insurance, as it is conducted in this country and all over the world, is inelastic and in some respects inequitable, it is arguable that no other system is suited to the peculiar conditions on which the business must be carried on. It is a business which is done in huge quantities "over the counter," so to speak, and the insurance companies know little or nothing of the character or position of the persons applying for insurance. Nothing but a rather rigid insistence on the principle of pure indemnity for actual loss or damage sustained can provide the necessary bulwark against carelessness and fraud, especially as the properties covered by the insurances are in most cases within the full control of the persons insured. It may also be contended on behalf of the system that its success—proved in all countries and based on the experience of two centuries—shows that it meets the needs of the public. Had any other been possible, commercially, there would have been no lack of energetic exponents. Even those companies and private underwriters who take up the classes of business refused by some of the orthodox offices—such as the insurance of pictures, jewelry, etc., at fixed values, and the insurance of "loss of profits" arising out of fires—agree that large general fire insurance operations must be run on the present accepted lines of indemnity for direct losses. In support of this we have the solid uncontrovertible fact that fully 95 per cent. of the fire-insurance business of the world is orthodox insurance.

No criticism of insurance principles is sound which does not take into account the interests of the community as well as those of insured persons and of insurance companies. The public interest demands that fires should be prevented as far as possible, and their occurrence made inconvenient to those who suffer from them. The loss caused by every fire is a dead loss; no recovery of that loss is possible. All that insurance companies do is to spread the loss over a wide area. As the community as a whole must lose by every fire, whoever pays for it, any institutions which by their system or by their rules make fires inconvenient and enforce precautions against them are doing a great, almost inestimable, public service. And there is no doubt at all that the fire-insurance offices have, by their system of indemnity and by their collective efforts—call them a "ring," if you please—done more to keep down fires and to preserve property from loss than all the efforts, for generations, of legislatures and municipalities. The consistent, even remorseless, penalizing of bad risks, bad construction and equipment, and the concessions in respect of lower premiums to good risks, good construction and equipment, enforced year after year and generation after generation, have brought about in this country an immense reduction in the fire-risks and improvement in building. A system free from limitations, a system which would insure anything and everything provided that people "would pay the rates," a system which would allow values to be fixed in advance without inquiry and would thus permit wagering in insurance—such a system could never have deserved well of the public, however much fraudulent or careless owners of property might have found it convenient. It is, indeed, by those very features which, with thoughtless people, have caused unpopularity, that the British fire offices have most surely earned the gratitude and goodwill of the community at large.

A NEW YORK PUBLIC BATH.

IT is regrettable that the following notes were not published in our issue for last week, in explanation of the illustrations that then appeared:—

The West Sixtieth Street Bath-house combines a large pool and seventy shower compartments auxiliary, the best models of England and Germany have been followed by the architects, Werner and Windolph.

The exterior is of granite, limestone, brick, iron and bronze, and the entire interior side walls are laid up in a white impervious brick, which has been substituted for plaster and enamel brick, which have heretofore not proved satistory. There is no moulded trim of any description in the interior; all the surfaces have rounded corners, floors rounded at all angles, giving as far as possible unobstructed, easy, wash-down surfaces. Slate, marble and Novus Glass (impervious, opal white in color) are used for wainscot and linings.

Ease of communication and rapidity of handling the bathers are the prime considerations, and in order to do away with the crush at the entrance of the bath-house a special exit has been provided, insuring a steady in-and-out flow and uninterrupted movement of the bathers at all times. The capacity of the bath-house is 2,500,000 baths a year. Bath-tubs have been eliminated, as they have proved unsanitary and difficult to keep clean, and are also a source of jealousy and confusion in the bath-house.

It was feared it would be impossible to arrange for a plunge-bath in this type of bath-house, owing to the narrowness of the site, but the difficulty has been overcome by the disposition of the plunge in the lower part of the building, taking the entire width of the plot, with the men's and women's shower-baths arranged in the upper story. The dressing-rooms for the plunge are on the level with the street, and the staircase on either side gives access to the plunge below, which is solidly lined on all sides with slabs of opal glass, giving a wonderfully clean and sanitary purpose. The capacity of the plunge is 80,000 gallons of clear Croton water, with a distributed source of supply constantly kept in circulation, also having a constant in-and-out flow approximating 20,000 gallons an hour, or a complete change of water three times a day. A superficial current of water insures a clean surface water; these improved devices have been resorted to to perfect its sanitation.

The water will be raised in temperature from that of the street mains to 70 or 80 degrees Fahrenheit, according to the weather, although if deemed necessary it may be admitted to the pool at the temperature at which it enters the building. This result will be accomplished by passing the water through a special form of heaters through which the live and exhaust steam will pass. All the water entering the pool is thoroughly filtered by a most complete filter-plant, which will insure the water being absolutely pure and clean.

The cleansing room, which is used for all patrons who wish to use the plunge, is equipped with thirty-two showers, divided into rows or sections, each section being controlled by an independent supply and valve.

The electric lighting in the building is most complete. There is an electric light placed over each stall for the shower-baths, in the men's and women's baths, giving ample light for the occupants of the same, and the ceiling of the plunge room will be illuminated by clusters of electric lights, which are placed on the trusses. All the lights in the building will be so enclosed as to obviate the danger of short circuits in case the water should come in contact with any of the fixtures. The lighting is controlled from a central point and arranged in such a manner that only the attendants can operate the switches.

Provisions have been made in the upper part of the building for sixty-two showers for men and eighteen for women. The moving volume of water with a distributed source of supply makes this form of bath practically perfect from a sanitary standpoint, and it has received the endorsement of the Board of Health and the leading experts on this subject in the country. The bather has the option of the shower or the plunge bath; the latter will undoubtedly become the favorite form of bathing, as it gives the beneficial exercise, creates a desire for personal cleanliness, and stimulates friendly competition. The bath has been planned so that five turns give a standard distance of one hundred yards. In London and throughout England swimming competitions in the public bath-houses are already in high favor.

ILLUSTRATIONS

ROOD AND CHAPEL SCREENS—PLATES 26-33.

The Gothic screens of the Cathedral of Albi stand unequaled as examples of the skill of the carvers of the Flamboyant period in France. The detail is so lavishly distributed, the ornament so undercut, the effect is that of an exquisite piece of lace. Some poetic mind has compared the sturdy forms of Romanesque ornament to the early development of vegetation—the bursting of the buds—the true Gothic to the full-flowering plant. The work at Albi, to carry this simile farther, can be compared only to the "sere and yellow leaf," for it resembles nothing so much as the withered leaves and dried branches of the oak in winter. It would be almost an impossibility to carve such minute detail in any other material than the wonderful stone France alone possesses, and even then some temporary backing of plaster-of-Paris must have been provided and carving tools rather than a mallet and chisels used. The jubé is a true one, the straight balustrade on either side marking the position of the pulpits from whence the Epistles and Gospel were read or intoned, though in the ornamentation of the screen the pulpits seem to have been somewhat lost sight of and have been made mere balustrades. The central cross or Rood, now destroyed, must have been a wonderful piece of Gothic design and workmanship. The statues, too, are missing, destroyed doubtless during the French Revolution.

At Chartres the screens around the choir of the Cathedral have the same delicacy in carving as at Albi, though the architecture forms merely a frame for the sculpture. The base of the screen is Renaissance, the pilasters and canopies Flamboyant, a fact which gives the student a unique chance for a comparison of the two styles at the moment of transition.

The screens in the Church of the Trinity, at Fécamp, in the north of France, are among the most interesting examples of the French Renaissance. The detail is varied in every feature, the same moulding showing several different ornamentations in its length, and the panel and pilaster decorations are bewildering in their variety. There is a strong resemblance in the character of the ornament here used to the work of Bramante at Milan, in the Church of San Satiro. To follow this resemblance would prove a fascinating task for an architectural student, a veritable voyage of discovery. W. T. P.

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NOTES AND CLIPPINGS

RESTORING CARNARVON.—The King's interest in historic castles and ancient monuments is shown by the statement of Sir John Puleston, the custodian of Carnarvon Castle—erected some 700 years ago—that the Office of Works has been instructed to send its architect to Carnarvon to confer with Sir John with a view to a more ample restoration of the old edifice in which the first Prince of Wales was born.—*London Globe.*

ST. BOTOLPH'S, BOSTON, ENG.—St. Botolph's Church in Boston has so fine a tower that the other parts of the building become rather diminished in interest. The building was commenced in 1309, and it is one of the best examples of its class in the country. In 1857 it was restored, mainly by donations from Boston in the United States, whose people claimed an interest in the church. As a property it is somewhat peculiar, for the Corporation are the lay impropriators, having purchased the tithes in the sixteenth century. We suppose it was expected that New England would again intervene, for the chancel roof has been allowed to fall into so bad a state that a gale of wind or heavy snow might drive it in and a serious catastrophe ensue. The Borough Engineer, Mr. G. A. Clarke, has called in Mr. W. S. Weatherley, architect, and they have prepared a report on the decay which no doubt has long been apparent to worshippers. According to Mr. Weatherley, the time has passed for repairs and the roof must be reconstructed. Mr. Clarke estimates that the cost will be about £1,000.—*The Architect.*

A MASONIC CORNER-STONE FEAT.—The current removal to a new site of the Soldiers' and Sailors' Monument at Providence, R. I., recalls to the *Journal* of that city a picturesque incident that attended the laying of the original corner-stone. The tale is told in these words:—

"At the last moment it was learned that there had been a misunderstanding between the architect and the contractor who was to furnish the stone for the monument and that the corner-stone was not to be delivered by him, as promised. It was then proposed to substitute a smaller stone. One about as large as a tea-chest was secured, under which the box was to be placed and over which the ancient services were to be held. Later it was arranged the real stone would be placed in position. This proposition disgusted the Grand Master, who considered that it would be little short of a sacrilege, and he was on the point of postponing the whole Masonic proceedings, when Frederick Miller, an energetic member of the Craft, suggested that a party be organized and that the stone be captured and brought to this city. A special train was engaged and volunteers were looked up. These were to proceed to Westerly, where the contractor, that the stone might remain in that town over the day set for the services, had caused the heavy object to be rolled off a flat-car and left in a sandy spot. One of the party went on in an earlier train, that he might post some of the Westerly brethren of the intended *coup*. The others followed on the special, which consisted of a locomotive, one passenger-coach and a platform-car, reaching Westerly just before midnight. A dozen Westerly brethren were in waiting to 'meet a man,' as they had been informed, but when posted as to the real cause of their being summoned to the station gladly lent a hand. There were no tools, no hoisting tackle and nothing to work with. The situation looked desperate. The premises of a building-mover were raided, rollers, skids and other necessary articles were 'borrowed,' and just before daylight the big stone was safely placed on the flat-car and the run to this city was begun. There was never a more tired lot of individuals, for the work which they had performed was wholly out of their line. The special reached this city before the populace was fairly astir and the flat-car was left on the track immediately in front of the foundations. Workmen were sent for, the stone was unloaded, and the grand ceremonials were carried out as originally intended. At the time it was ranked by some as an undertaking equal to the burning of the *'Gaspee,'* in that it showed the same indomitable spirit. The action of the Masonic brethren helped both sides out of an unpleasant dilemma, for neither the contractor nor the architect wanted to give in. The monument was dedicated September 16, 1871."

The American Architect and Building News

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SOCIETIES, PERSONAL MENTION, ETC.

THE annual report of the head of the Boston Fire-Department explains an innovation he has devised, and though it will probably be found of doubtful efficiency, it may deserve to be copied in other cities. Realizing that building accidents must happen, and perceiving that the city could hardly maintain in expensive idleness efficient wrecking-apparatus and their crews, after the manner in which wrecking-trains are kept always in readiness on well-managed railroads, Mr. Wells has made arrangements with certain large contractors in each fire-district, under which these men engage to furnish with promptitude teams, men and lifting apparatus, on receiving instruction by telephone to do so. The idea is excellent, but it is doubtful whether aid of much real efficiency can in this way be secured. Contractors do not keep men, teams and apparatus in idleness, nor do they confine their normal operations to the fire-district where their headquarters is situated, so it seems extremely doubtful whether the most active telephoning can summon as speedy and efficient help as can in less time be obtained from the regular "sidewalk-brigade." As some of the German fire-brigades are equipped with well-furnished and powerful wrecking-wagons, it would seem as if Boston and other cities that endeavor to maintain a first-class fire equipment should be willing to bear the cost of two or three motor-trucks fitted with powerful cranes of the railroad pattern, an abundant supply of jack-screws and the other needful paraphernalia.

THE head of the New York Fire-Department also is an innovator, but he is of an ambitious turn of mind, and seeks to have awarded to him a quarter of a million dollars with which he desires to build and equip a "college for firemen," whereat firemen may be more adequately trained than in the present outgrown "school of instruction," at headquarters. Including this sum, he asks for six million dollars over and above the regular appropriation, to be spent, during the next three years, in putting in a new fire-alarm system, building new fire-engine houses and repairing old ones, for new apparatus, and so on. This occasional, if possibly necessary, expenditure, in a single city, of so considerable a sum as six million dollars, drawn from the tax-payers' pockets, for such a purpose should attract attention, for it is one more evidence of needless waste, one more measure to be applied to the folly of longer allowing the erection of combustible buildings. Mr. F. Harcourt Kitchin, in the paper on fire-insurance published last week, states the position well, but imperfectly, when he says that "the public interest demands that fires should be prevented so far as possible, and their occurrence made inconvenient to those who suffer from them." If he had omitted his last preposition, his statement would have been a stronger and more logical one, and it would have brought his recommendation into line with the custom that prevails in Continental cities, where the man who "suffers" a fire to break out is heavily fined.

BROADLY speaking, the community does not, it is hardly proper that it should, legislate for the benefit of the individual. There is no public ordinance that restricts the sale of comestibles lest a man may kill himself by over-eating, for, if he does, it is merely a warning to his neighbors not to do the same thing. It does not encourage them to go and do likewise. But there is propriety in legislation intended to prevent and control contagious diseases, which may spread from the unclean or ignorant individual who originates them to the community at large. Just as no legislation aimed at the prevention of contagious disease is held by the public too grinding and unendurable, so no disease that can affect the public welfare is more contagious than a conflagration, and yet comparatively little effort is made by the public to deal with it preventively. Millions are spent yearly in handling the disease after it breaks out, but only hundreds in steps to prevent its outbreak. Looked at fairly, it is really the community at large that is the culprit, since it "suffers" fires to take place, when it really has the power to prevent them. It looks calmly on at the expenditure annually of millions, millions which come out of its own pockets, for the maintenance of imperfectly effective fire-departments, and yet if but a half of the money spent in New York City in this way had been divided amongst the improvers of real estate so as to cover, in the case of each improvement, the difference in cost between combustible and incombustible building, the greater part of the city would now be indestructible. And yet the tax-payers would have been assessed actually the same amount. This simple method could be adopted from to-day, and future generations would look with reverence on the men who devised this system and honestly administered the details of its application. It is, of course, too Utopian a method to adopt until Altruism and all the other good isms are with us to stay.

BUT what is entirely practicable is to promote incombustible building by encouragement, not by punition; for property-owners are like children, they

Entered at the Post-Office at New York as second-class matter.

object to being made to do disagreeable things which benefit other people rather than themselves, and, since a real-estate improver can protect himself with the aid of the underwriters, it is obvious that he must feel that he is being made to build indestructibly for the benefit of others rather than for himself, and, like a grown-up child, he avoids the issue when possible. The theory under which advances in fireproof building have been made hitherto is largely, if not altogether, a mistaken one. It has been the assumption that a real-estate improver, as a sane business man, should be able to perceive how much it was to his own ultimate advantage to build an indestructible building, and so save in the long run a large amount in insurance on building and contents. The true theory, we are convinced, is that incombustible buildings *must* be built, and for the sake, not of those who own and occupy them, but entirely for the sake of those who do not, the public at large, that is. It is really immaterial to the tax-payers whether an individual elects to let his building be destroyed by fire, but it is of very real interest to the public that the property of other people shall not be destroyed at the same time. This once comprehended, it is easy to see that the real responsibility rests on the public, and not on the individual. It is for the public then to examine the ways in which it can discharge its duty to itself at least cost to the tax-payers, and here, as in the case of all other contagious diseases, time is of the essence. It is desirable to substitute unburnable for burnable buildings with the shortest delay possible, since a conflagration may occur any day, and the process can be better accomplished by coaxing than by compulsion. One persuasive device we pointed out a few weeks ago—the remission of all, or the major part, of the taxes on new incombustible buildings until such time as the amount of taxes so remitted shall equal the difference in cost between a combustible and an incombustible building of the same size and architectural character. Another persuasive device would be, to deposit the city's funds in the hands of the mortgage and title insurance companies, for instance, instead of in the banks as now, on the condition that these corporations should make no building-loans except on buildings of absolutely incombustible construction.

IF, however, the public is unwilling to adopt a sensible, if somewhat altruistic attitude, and, as usual, prefers the rôle of the bully, there is a method by which people can be dragooned into better building, and that, of course, is the main thing to be considered rather than the ethical status of the method. At present, what happens? A man's building gets well afire, but before the damage becomes irreparable the fire-department succeeds in putting out the fire. The owner is profuse in his thanks to the firemen, and sends them a few boxes of cigars or a contribution to their relief fund. Why should he do more? Isn't that just what he has been paying taxes for? He has only had the use of a public utility. That's what he and the thoughtless think. In reality, he has had an unfair and selfish use of common property, one which his neighbors owning incombustible buildings, though tax-payers also, can never enjoy. To equalize things, he should be made to pay for the pleasure of having a fire. He can afford to pay. He is well insured—at the expense of premium payers. The way to dragoon such men into the ways of common-sense is to make them "suffer." How? Establish fire courts, organized after the pattern of admiralty courts, and in the case of every fire collect as "salvage" from the owner of the building a substantial percentage of the money received from the insurance companies; a small portion of the sum recovered to be paid to the firemen's relief-fund, a similar amount to be turned over to the fire-department itself, while the major part should be set aside as a fund to offset the amount in taxes remitted to those real-estate improvers who voluntarily build after the most perfect methods known, methods the law does not find it proper to enforce as yet. The doctrine of salvage might reasonably be applied in such a sea-girt city as New York, where, when fires occur along the shore, the imperiled property receives the aid not only of the public fire-boats, but that of every tug, steamboat, or ferry-boat that can bring a "stream" to bear, and by a slight extension of admiralty law these marine salvors have a right to salvage. As it would not be equitable to exact salvage only from shore-built property, the doctrine, by extension, could be made to cover inland property as well.

WHEN the time shall come that New York or other large city shall determinedly and sensibly set about providing itself with incombustible buildings, through using for its own defense its public funds in coöperation with private capital, then there should at the same time be accumulated a fund the income from which could be used in pensioning the surviving architects of the day, who, having brought into being an incombustible and indestructible city, at the same time will have destroyed their own chance of earning a livelihood. The fear of building themselves out of a living need not have any terror for the practitioner of this generation; but the completion of the transformation of combusible into incombustible buildings in a given town—a condition which will inevitably eventuate—will, of course, force the local architects to transfer their offices and homes to undeveloped towns. The indestructible building is not going to be torn down and replaced at the dictate of whim or fashion with the same ease and fluency, so to say, that attend the replacing of a combustible building nowadays, and this is clearly proved by the experience of the unfortunate contractor who undertook to wreck the old Coal and Iron Exchange building, built of brick and iron, by Mr. Hunt, some forty years ago, and so, for its time, an exceptionally strong and well-built structure. The wrecker, long before he got the site clear, found that though he had already expended thirty-five thousand dollars on the job, he had already largely exceeded his own estimates of the cost, and, moreover, found his second-hand material almost valueless, as all the brick had been laid up in cement, and so could not profitably be cleaned for future use.

THE USE OF BURNED CLAY PRODUCTS IN THE FIRE-PROOFING OF BUILDINGS.[1]—II.

SEVERAL systems of floor construction are used with hollow tiles in which steel tension materials are used, and concrete is combined with the tiles to resist pressure, making it possible to introduce very long spans. These are not arches, but lintels.

In the Johnson System, patented by E. V. Johnson (See Figs. 7 and 8), the extension is taken up by a steel fabric laid in a bed of cement between the tiles. The tiles are then laid on the end-pressure principle on this bed of cement and placed an inch or more apart; after which the spaces are filled with cement, and it is spread over the top of the tiles. This is then ready for whatever finish is put on to form the floor. This system of construction is laid so as to form a continuous floor over the whole building, crossing the girders, and enters a certain distance into the exterior walls. It has been extensively used in hotels, asylums and manufacturing buildings. (See also Figs. 6 and 8.) The most perfect piece of work done in this manner is in the floors and roof of the Underwriters' Laboratories at Chicago. These floors are built in the manner above described, but, in addition, a

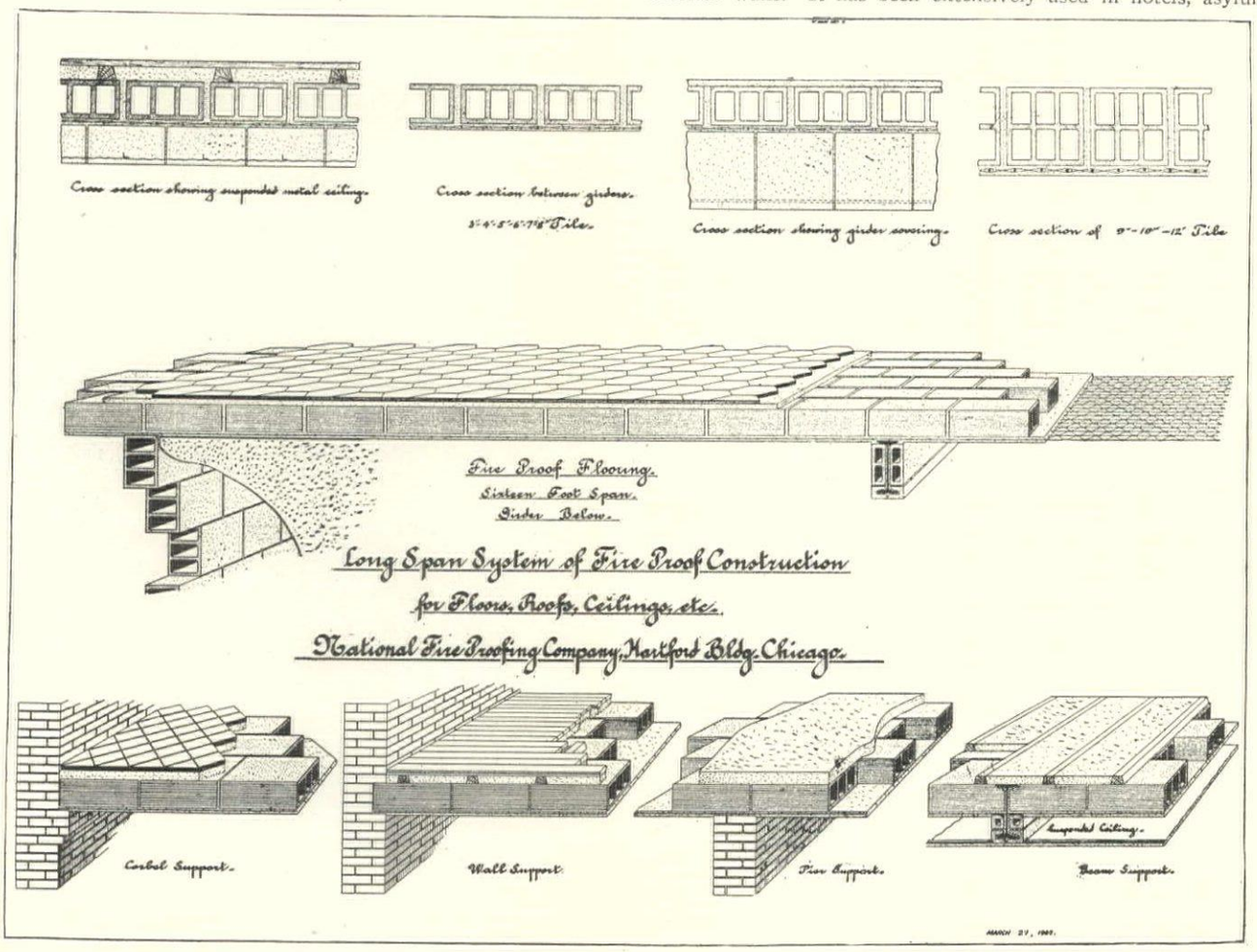


FIG. 7. JOHNSON SYSTEM OF FLAT FLOOR CONSTRUCTION WITH STEEL TENSION.

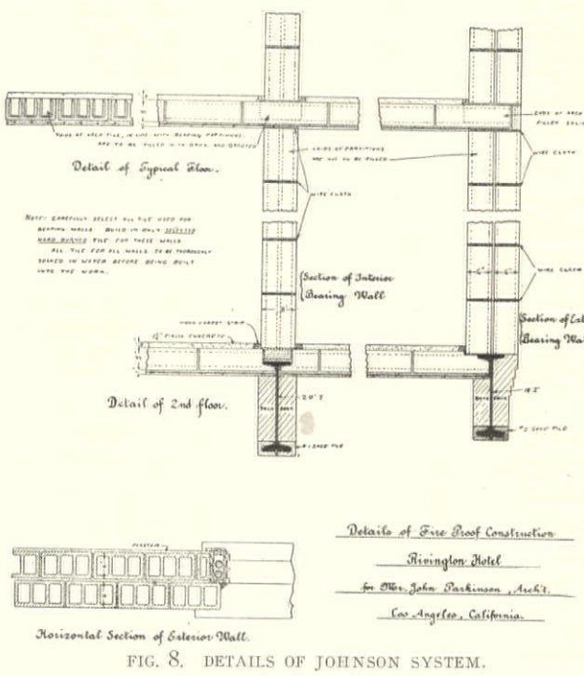
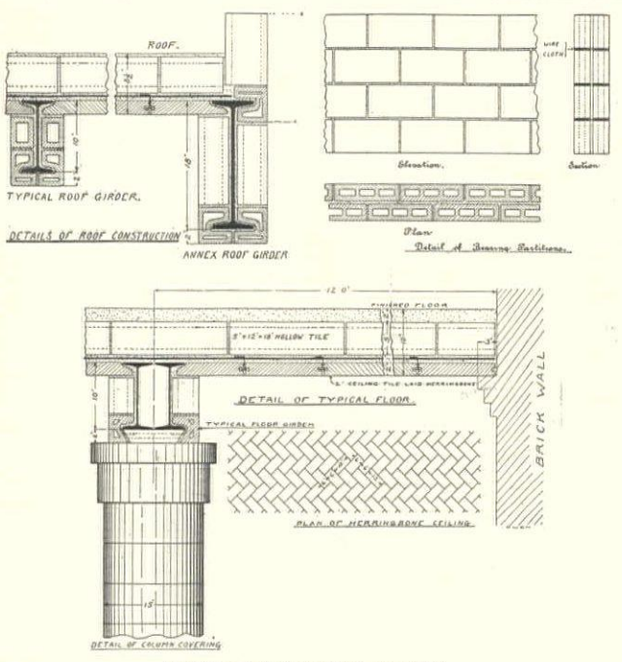


FIG. 8. DETAILS OF JOHNSON SYSTEM.



DETAILS OF JOHNSON SYSTEM.

[1] A paper by Peter B. Wight, F.A.I.A., Editor of "Fireproof Magazine," presented at the International Congress of Architects, London.

ceiling of 2-inch porous tiles is set under them and wired to the tension fabric before the bed of cement is spread. They are set herring-bone fashion and left without plastering, cleaned off and the joints in the ceiling scraped out and carefully pointed. (See Fig. 9.)

The Vevier System (patented; see Fig. 10) is built from beam to beam with straight tiles, the bottoms of which are two inches

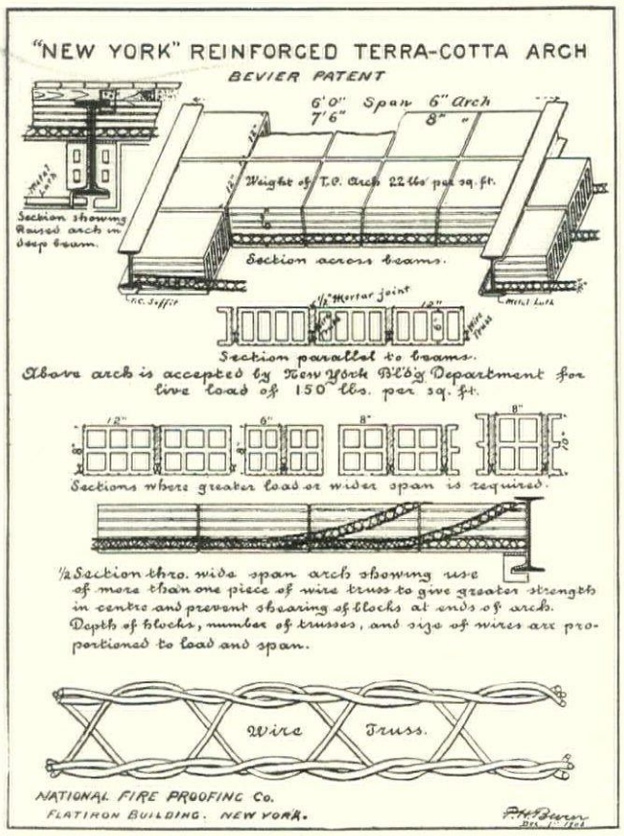


FIG. 10. BEVIER SYSTEM OF FLAT HOLLOW-TILE TENSION FLOOR.

below the beams, as in end-pressure arches, but the joints are vertical. The same soffit tiles as in the floor last described are used for the protection of the beams. There is introduced between the courses of tiles from beam to beam a wire truss reinforcement bedded in the joint. In very long spans two and sometimes three of these reinforcements are built in the joints and turned up at the ends to provide against shearing. This system of floor-construction was recently successfully tested by the British Fire-Prevention Committee, which published a detailed description of it. (See Fig. 11.)

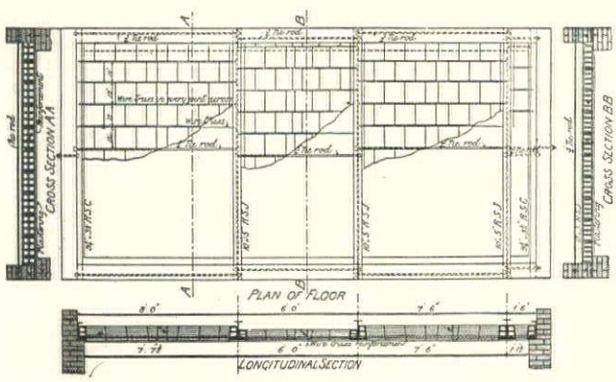


FIG. 11. PLAN AND SECTION OF BEVIER FLOOR TESTED BY BRITISH FIRE PREVENTION COMMITTEE FOR "FULL PROTECTION."

A third patented tile floor with tension-member is known as the Kahn System. This combines some of the features of the Johnson and Bevier systems. The tiles are laid in the same position as in the Bevier floor, but somewhat wider apart, so that three or four inches of concrete are filled in between them. In this concrete are set tension-bars of a special pattern of rolled steel which are cut and bent so as to apportion them to the true strains. The illustration I will give (See Fig. 12) is from a detailed drawing of a modification of the Kahn System, as used by Captain John S. Sewell, Corps of Engineers, United States Army, in charge of the erection of New War College at Washington, D. C., where it is used in all the floors. The special tiles used were designed by Captain Sewell.

The last three systems involve the same principles of construction as the reinforced-concrete floors of Monier, Hennebique and

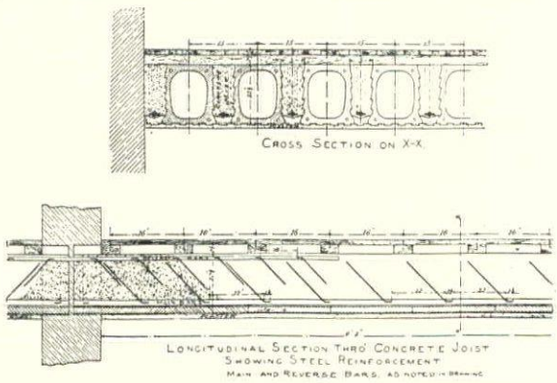


FIG. 12. FLOOR OF REINFORCED-CONCRETE WITH HOLLOW-TILE SEPARATORS, FLAT CONSTRUCTION, KAHN SYSTEM.

the many different kinds that have recently been introduced in the United States. The main difference is in the weight of the floors, which is very much less (at least 30 per cent.) than that of reinforced-concrete of equal strength.

* * * * * * * * * * * *

Hollow-tile partitions not only fulfil constructional conditions, as they are miniature walls, and often weight-bearing, but act as fire-stops. In the full steel-skeleton buildings there are no brick division-walls, and hollow tiles are depended upon to provide all stops against the horizontal spread of fire. The Baltimore and San Francisco conflagrations revealed the weakness of hollow-tile partitions as formerly used, but did not betray any fault in the

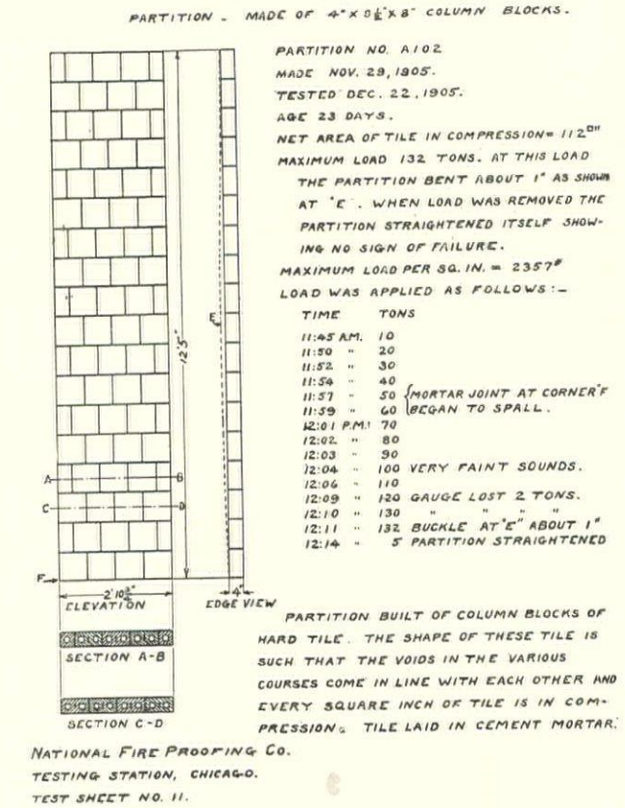
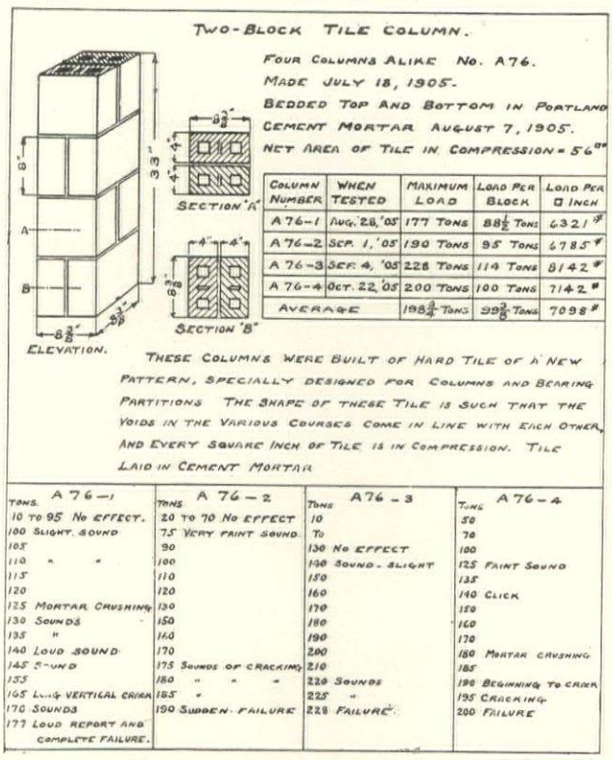


FIG. 13. TEST-SHEET, NATIONAL FIREPROOFING COMPANY, SHOWING FOUR-INCH HEAVY TILE PARTITION.

material itself. They were found to be insecurely placed in many ways, and permeated with wooden frames, sashes and doors. This defect is now being rectified. Partitions are made heavier, frames are of steel, doors incombustible and sashes of metal glazed with wired glass. With these precautions any other means for stiffening hollow-tile partitions are unnecessary. They vary in thickness from three inches to eight, according to the length and height, and porous terra-cotta is preferable because it can be

penetrated by screws and sometimes by nails. But a very excellent metallic wall-plug is also used in the joints, making a perfect nailing device. The best examples of model partitions are found in the new Underwriters' Laboratories at Chicago. (See Fig. 9.) I confidently believe that it is to-day the most thoroughly fireproof building in the world for business purposes.



Column Number	When Tested	Maximum Load	Load Per Block	Load Per □ Inch
A 76–1	Aug. 28, '05	177 Tons	88½ Tons	6321 #
A 76–2	Sep. 1, '05	190 Tons	95 Tons	6785 #
A 76–3	Sep. 4, '05	228 Tons	114 Tons	8142 #
A 76–4	Oct. 22 '05	200 Tons	100 Tons	7142 #
Average		198¾ Tons	99⅜ Tons	7098 #

Tons. A 76–1	Tons A 76–2	Tons A 76–3	Time A 76–4
10 to 95 No effect.	20 to 70 No effect	10	50
100 Slight sound	75 Very faint sound.	To	70
105	90	130 No effect	100
110 " "	100	140 Sound - slight	125 Faint sound
115	110	150	135
120	120	160	140 Click
125 Mortar crushing	130	170	150
130 Sounds	150	180	160
135 "	160	190	170
140 Loud sound	170	200	180 Mortar crushing
145 Sound	175 Sounds of cracking	210	185
155	180 " " "	220 Sounds	190 Beginning to crack
165 Long vertical crack	185 "	225 "	195 Cracking
170 Sounds	190 Sudden failure	228 Failure.	200 Failure
177 Loud report and complete failure.			

FIG. 14. TEST-SHEET, NATIONAL FIREPROOFING COMPANY. A SHORT 8"x8" STANCHION OF HEAVY 4"x8" HARD-BURNED TILE.

For bearing purposes extraordinary strength has been developed in hollow-tile partitions. In the Underwriters' Laboratories partitions were built of two courses of three-inch tiles, tied together, which took the place of iron columns in carrying the ends of steel girders. A specially burned heavy hard hollow-tile has been made which has developed a crushing strength of from

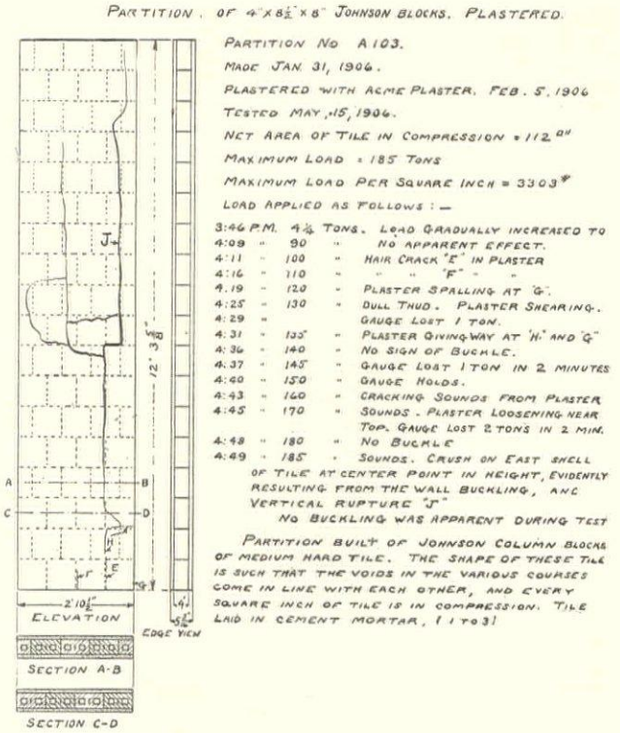


FIG. 15. TEST-SHEET, NATIONAL FIREPROOFING COMPANY, SHOWING 4" HEAVY-TILE PARTITION WITH CEMENT FINISH ON BOTH SIDES.

6,000 to 8,000 pounds per square inch in the net section of clay used. A test was made November 29, 1905, of these tiles set as a section of a partition three feet long, twelve feet high and four inches thick, which sustained 130 tons before it buckled or showed any fracture, or 43 tons per lineal foot. (See Fig. 13.) These tiles have also been built into the form of 8x8-inch square stanchions 33 inches high for testing purposes, and one of them sustained a load of 228 tons before crushing, or 8,142 pounds per square inch of sectional area of the material tested. (See Fig. 14.) Tests of large stanchions built of these blocks, without reinforcement, will soon be made at the University of Illinois, from which even better results are expected.

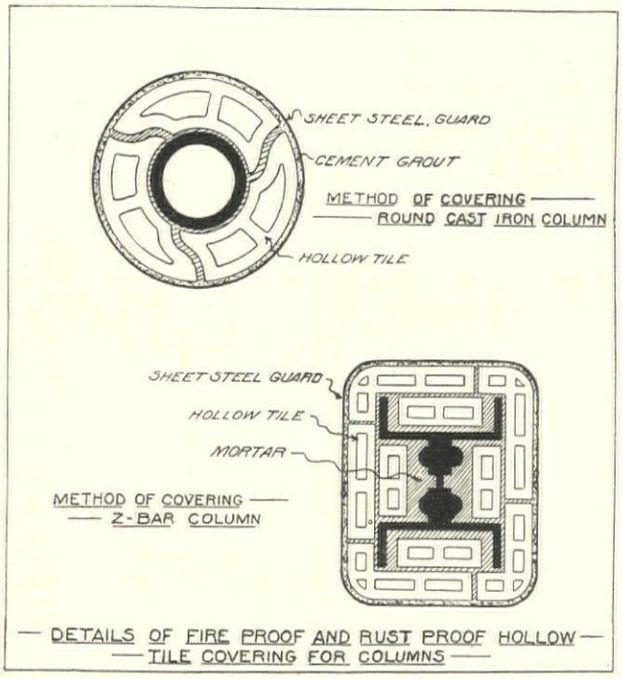


FIG. 16. COVERINGS FOR CAST-IRON AND Z-BAR STEEL STANCHIONS: WESTERN ELECTRIC COMPANY'S BUILDING, CHICAGO.

* * * * * * * * * * * *

While preparing this paper a very remarkable test has been made of 4 x 8-inch column tile, built into a section of partition. This test was made in the presence of the officials of the Department of Buildings of the city of Chicago, who have signed the test-sheet, a copy of which is shown as an illustration. (See Fig 15.)

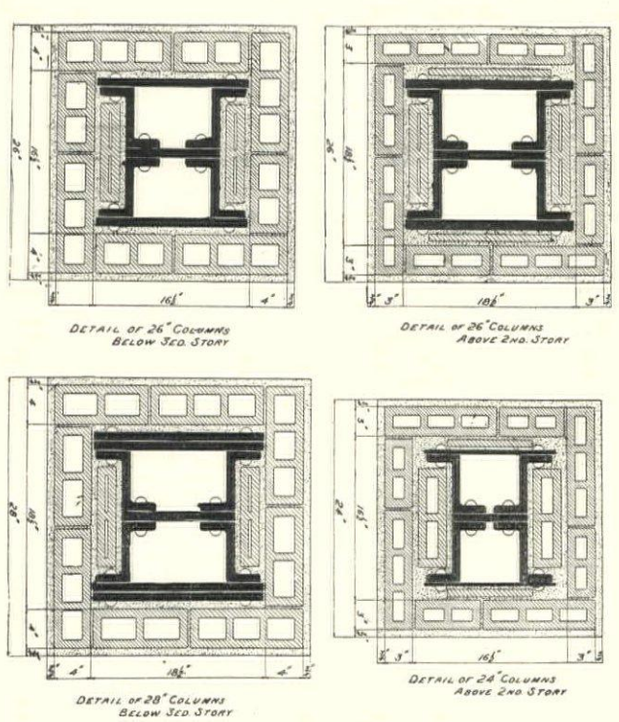


FIG. 17. FIREPROOFING OF Z-BAR-AND-PLATE STEEL STANCHIONS: U. S. GOVERNMENT BUILDING, CHICAGO.

Of the uses of burned clay as a fire-protecting material for covering steel members of construction the most important are stanchion fireproofing and girder fireproofing. The most vital

points in buildings are to be found when steel stanchions are required to be used. Cast-iron stanchions are now seldom used in fireproof buildings except in those of four to six stories in height. Fireproofing of cast-iron stanchions with porous terra-cotta was brought to great perfection between 1875 and 1890; in fact, attention was first directed to the importance of fireproofing the ironwork of buildings by several disasters from fire which had occurred in buildings in which cast-iron stanchions were used. The first statutory regulation to prevent such accidents was in the building-law of the city of New York thirty-five years ago, which required that all cast-iron stanchions supporting brick walls should be double, one within the other, and each of sufficient strength to carry the load. Now all stanchions, whether of iron or steel, are required by the building-laws of all our large cities to be made fire-resisting with outside coverings. It is held in all of these that the stanchion must first be covered with pure cement, leaving no air-space between steel and tile.

The illustrations here given (Figs. 16, 17 and 18) are horizontal sections of steel stanchions, showing different sections of steel and methods for covering them as now used. I desire also to call attention to the sections of steel stanchions shown in Plate 3,

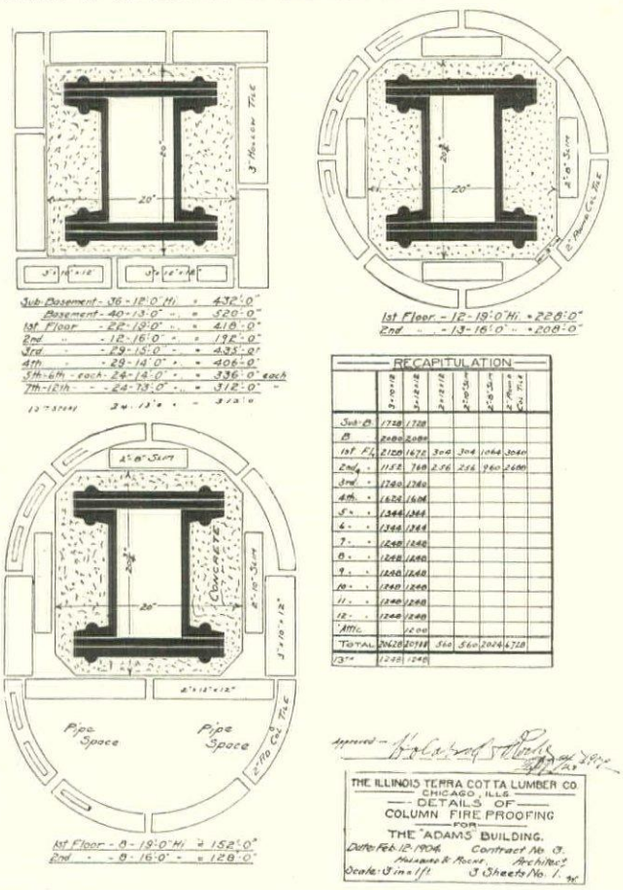


FIG. 18. SECTIONS SHOWING CHANNEL-AND-PLATE STEEL STANCHIONS AND METHODS OF FIREPROOFING STEEL IN THE ADAMS (NOW REPUBLIC) BUILDING, CHICAGO.

with their fireproof covering, which are known as the "plate-and-angle columns." (In the United States all stanchions used in construction are called "columns," whether they have architectural form or not.) This is the section which has recently been most favored by engineers and architects, because of its economy and other advantages in facilitating the best connections and the rapid construction of the steel frame. There are several other simple forms evolved from the commercial products of the steel mills which have been gradually superseding the patented sections. In Fig. 16 will be seen the common method now used in protecting round cast-iron stanchions.

(To be concluded.)

VITERBO.[1]

VITERBO is only fifty-four miles from Rome and is connected with it by a special railway, yet one suspects that its name is almost unknown to a large number of the Englishmen who travel in Italy. One obvious reason for this neglect is that, since the railway began to bear visitors to the South, Viterbo, instead of lying on the high road to Rome, has been left isolated betwixt the new routes. Yet it is a well-preserved mediæval town, with walls, churches, and palaces which will repay a visit. If it is wanting in a distinguished school of painting, it has developed an architecture of its own, which is curious and of considerable value for the history of the art. Its chief attraction, however, lies in its historical associations—in the part it played in the Middle Ages both as a place of refuge for the Popes and as a plucky combatant in the struggle between Pope and Emperor. It makes, too, a special appeal to the Englishman, since the one English Pope figures in its story and since an English prince was murdured on the steps of the altar of one of its churches. A further inducement to visit the city is the recent improvement of the hotel accommodation, the increase in the number of travelers in motor-cars having prompted the proprietor of the principal inn to raise his house to a quite satisfactory standard of comfort. . . .

Even to-day Viterbo at once shows itself to be a mediæval town to a stranger who drives into it from the railway station. He will catch a glimpse of the old wall, and, outside this, of the fine Torre di San Biele, with its two stories, each having its battlements and its curious combination of round and pointed arch, which was erected as an advanced fort in 1270. Inside the gate the first impression may disappoint one who has read of the battles and the pageants described in its history. He may feel, as J. A. Symonds felt on visiting Syracuse, that the reality had a disappointing smallness. The streets are narrow, the squares mostly small, and there are no such imposing buildings as the cathedral and the Palazzo Pubblico of Siena. Yet he soon discovers that it is, so to say, drawn to scale; and after he has grown accustomed to the standard he will find much that is architecturally interesting. A large part of these relics of a past art date from the period of Viterbo's most strenuous life—the interesting period in the history of Italian architecture in which the Lombard Romanesque style was in its bloom, and passing into the richer style known as the Lombard Gothic or "Gothic Romanesque."

It is natural to turn first to the famous historical spot, the Piazza San Lorenzo, where stand the cathedral and the Pope's Palace (now the episcopal palace). As a whole, the square has an unfinished look, and its buildings impress one as small and as bleakly isolated one from the other. In adition to the cathedral and the Pope's Palace there is but one other building—a "mediæval house," referred to the thirteenth century. It has a charming little façade, on the lower division of which is an arcade of two circular arches, now filled up, and on the upper division, marked off by a dainty cornice, are two small round-arched windows, having each two lights, divided by a delicate shaft, with pretty tracery above.

The piazza stands on one of the highest parts of the city, the cathedral occupying, it is said, the site of the ancient Castrum Viterbii. This building, with its later Classical façade and its fine campanile, marked with black and white horizontal bars in the Sienese manner, is impressive even from without. The body of the cathedral represents the Lombard church of the twelfth century greatly reduced. The Gothic campanile dates from the fourteenth century, with later restorations. The most interesting feature of the interior is the curiously carved capitals, some in leaf pattern, others in the form of winged quadrupeds, others again in that of human faces. Here a lover of ceremonial spectacle would naturally recall the Papal coronations and sepultures which took place in the church. The imagination of a student of history might select a politically important event, such as the meeting of the Great Council in 1207, or one of those incidents which touch the deeper human emotions. Among these the most solemn and most pathetic was surely the excommunication passed here in 1268 by Clement IV. on the Hohenstaufen lad Conradin. This darling of the Ghibellines had ignored repeated summonses to appear before the Pope, and a like indifference showed itself in the young prince just after the excommunication, when he and Prince Frederick of Austria rode defiantly at the head of their troops past the city, and the Pope, with prophetic shrewdness, remarked to his cardinals: "Behold the victims led to the sacrifice." The handsome modern tomb of John XXI., set up in the cathedral opposite the modest old one, carries the thoughts back to the sinister event, the swift succession of three Popes in a single year (1276), and to the sudden death of John by the collapse of a room which he had just built in the palace.

The Pope's palace looks from the front a puny and shabby building. This impression is due partly to its state of decay, partly

[1] Extracts from a paper in "The Edinburgh Review" for July, 1906.

to its position. It stands at the edge of a precipitous side of the narrow valley of Faulle, and when looked at from behind it is a distinctly impressive structure, set high, like the church which it represents, on a rocky foundation, strengthened by a stone wall, stout buttresses, and a massive arch. Entering the building, one steps into the famous Hall of the First Conclave, through which one passes to the old Papal apartments. It is a dingy, badly lit place, though by peering up one can manage to see something of its fine wooden roof. It must have worn a very different look in the old days when the cardinals gathered here, well lit with six windows on either side, similar in form to those of the palazzina opposite. These have long since been covered over, though from the back one can still see the frame of those on the hinder wall. The gem of this structure is, however, the open loggia added to the palace in 1267. It runs to the right of this over the deep arch. Up to 1903 it had been sadly neglected, its graceful arches being filled in, but in that year the restorer took it in hand. Photographs have happily preserved the look of the half-ruined arcade. The Gothic arches formed by an interlacing of larger circular ones are not only elegant, but seem to be appropriate as suggesting one way in which the evolution of the "Gothic Romanesque" may have arisen out of the "Lombard Romanesque." Above the arcade is a kind of frieze in which an alternating lion and a shield represent the city of Viterbo and the Gatti family, to which the founder of the palace belonged, while higher still may be seen traces of the symbols of Pope and Emperor. The loggia was built as a place where the Pope could show himself to the people and give them his benediction. . . .

From the retired piazza on which the ecclesiastical life of Viterbo was focused, the visitor will probably pass to the larger and more impressive one in the centre of the city, in which the civic life entered, the Piazza del Plebiscito. The buildings speak of a commune with large and various functions. The finest is the Palazzo Municipale, the construction of which, with the piazza, was begun in the year 1264. Only the fine arcade of the original palace survives. In this building are the library, the archives of the city, and an interesting museum containing Etruscan tombs and other curiosities, as well as paintings by Lorenzo di Viterbo and other local painters. The other striking feature of the piazza is the Communal Tower (Torre del Comune). This tower, which fell and was rebuilt in 1487, is 44 metres in height and lifts its slender form, crowned by the lightest of iron belfries, with an aerial grace which will charm even one who is familiar with the famous Torre del Mangia at Siena. A curious detail in the piazza is two large stone lions on granite columns. The one on the south end represents the Guelph emblem of the Commune before the destruction of Ferento (1172); the other at the north end, which has a palm tree, the symbol of Ferento, added to the lion, is the emblem of the city after this event.

On this piazza more than one exciting Parlamento has been held, more than one fierce battle fought. The fiercest was that when the people, in 1387, rose against their tyrant Francesco di Vico, whose oppressions had passed the limits of endurance. It was the feast of the archangel St. Michael, and from the belfry of the church of Sant' Angelo, at one corner of the piazza, fluttered a flag with the image of the saint. Just when the citizens were losing ground this banner fell in their midst, a favorable omen which so rallied their spirits that they fought with redoubled energy and drove the tyrant from the place. This church of Sant' Angelo adds another interesting detail to the piazza, a Roman sarcophagus, whose sculptured surface depicts the hunt of Meleager. A popular legend has interred in this beautiful tomb one of the worthiest of Viterbese women, Santa Galiana. This lady, so the story runs, lived about the middle of the twelfth century and was of a rare beauty, being known as "la Bella Galiana." A Roman baron was urged by a mad love for the famed damsel to attack Viterbo in order to carry her off by force. Failing to enter the city, he prayed that the fair lady might at least be shown to him for a moment on the wall. He was granted his request, and at sight of her spite and envy so mastered him that he aimed an arrow and shot her through the heart. . . .

But all the remains of mediæval Viterbo are not thus mean looking. The city has conserved some fine examples of the best periods of its architecture, of which not the least curious and beautiful is the Palace of the Alessandri in the tiny Piazza of San Pellegrino. It stands in one of the most battered and squalid quarters of the town, and the first view of it brings to the stranger who has threaded the long, narrow Via di San Pellegrino the rare thrill of a vision. Two sides are bounded by the palace. On the larger façade is a deep grotto serving as a balcony, framed in above by the mouldings of a wide (segmental) arch. The face of the balcony has a deep parapet cornice resting on finely cut corbels. Above the gallery the façade has mouldings of a fine pointed ornament. This part of the palace is connected by a passage, roofed over with half an arch, with a second building which, though squatty looking, has its meanness redeemed by a curious portico, the stunted columns of which suggest that the pavement has been raised. Behind this lesser wing of the palace appear two square towers. The Alessandri were a good Guelph family which supported the Gatti when the twelfth century was giving place to the thirteenth. The other two sides of the piazzetta are formed by a small chapel, which in its new façade looks out of place, and some small houses, which show from the coat of arms on their fronts that they were dependent on the baronial mansion. These houses and the half-ruined towers near the piazzetta, which are said to have belonged to enemies of the Alessandri, are eloquent of the hot fighting which must once have raged in this small and confined quarter of the city. The proud little edifice, which was saved from destruction by a special decree of Pope Innocent IV., is now occupied by modest husbandmen. There is no other surviving palace of Viterbo which can compare in architectural fascination with this. Yet more than one deserve a passing glance. Of these it must be sufficient to name the portion of the ancient Palace of the Gatti (twelfth century) visible from the Via Principe Umberto, and the very interesting Farnese Palace (fifteenth century), on the facade of which round-arched windows bravely surmount pointed ones.

It is, however, in its churches that Viterbo has conserved the choicest examples of its ancient architecture. They lie hidden away in their tiny piazzas from the highways of the city. One of the oldest is that of San Sisto, the lower and older portion of which is said by Pinzi to date from about the beginning of the ninth century. In this portion the two arcades with their slightly bulging columns and ornate capitals, and the fine arch at the end of the nave, all of a lightish stone, make up a pleasing whole. The extension of this church in the twelfth century by the addition of a presbytery and an apse, standing on a higher level and connected with the older church by a high flight of steps, has, no doubt, marred the original design; yet it introduces a certain element of piquant picturesqueness into the interior. This later apse, as well as the old square campanile, protrudes through the adjacent wall of the city, giving to this from outside one of its picturesque details. With this one must be taken another ancient Lombard church, that of San Giovanni in Zoccoli (St. John in sandals), which forms a curious contrast with the first. It is plain to the point of ascetic severity. The walls and the roof of beams are alike naked and gloomy. The only element of decoration is supplied by the bands of moulding (torus) which serve as rudiments of capitals. Everything here, says Pinzi, breathes of austerity, of mortification, of ultramundane aspiration, the spirit of the eleventh century.

The architectural treasures of Viterbo lie scattered about the city, often in out-of-the-way nooks, and the only way to seize clearly the characteristics and to imbibe the spirit of its art is to wander along its narrow and often gloomy streets, to cross its bridges and its *piazzette*, and to pass under its gateways. In this way one lights unexpectedly on picturesque relics of a past art, thrown into relief by commonplace and dingy surroundings, which affect the observer as the resurrection of flowers from under an ash-heap might affect him. Now it is an early Lombard campanile of uncouth and squatty form, yet with a promise of beauty in its apertures. At another moment it is a small palace, much defaced, but preserving a beautiful heirloom in an external staircase leading up over half an arch to a balcony and round-arched doorway, the balcony being adorned with a parapet cornice on corbels and with mouldings. Now, again, one's eye is arrested by a lovely portal, once belonging to a church, decked out with dainty spiral columns and a sort of rich frieze work made up of intersecting vines and Lilliputian human figures, the work of some fourteenth-century sculptor rejoicing in the prodigality of the new Renaissance art. Just after, it is a blackened fountain in a poor, dilapidated piazza, which has the form of a font with a peaked cover, every bit of its surface being carven into floral and human forms as carefully and as daintily as if it had been a chalice—one of the surviving thirteenth-century sculptures which led men to name Viterbo "the city of beautiful women and beautiful fountains."

If the visitor would fully seize the spirit of old Viterbo he should wander also beyond its gates, contemplating its fine battlemented wall and the many towers which rise above, glancing

back on the municipal and other towers of what once was called also "the turreted city" when these are touched by the glow of the setting sun, and ruminating over the massive foundations of Frederick's castle, so rudely cut across by the wall. He will find, too, outside the city some of its finest architectural treasures. Not far from the wall stands the church of Santa Maria della Verità, now turned into municipal offices, on the plaster of whose walls is preserved the finest painting by a Viterbese artist, the "Espousal of the Virgin," by Lorenzo di Viterbo, a work deserving to be better known, while in its cloisters, which are said to date from the thirteenth and fourteenth centuries, may be found tracery of a rare loveliness. Then there is the old Dominican church, Santa Maria di Gradi, where the weary body of the Pope was not allowed to repose; which, though now transformed into a penitentiary, has preserved its large and chaste Gothic cloisters and the portico in front of its façade. A longer walk brings one to the church of Santa Maria della Quercia, with its cloisters, a handsome edifice of the fifteenth century. . . .

Viterbo offers the traveler, indeed, an exceptional variety of excursions. He will find that one of the most interesting ways of leaving the place is to drive up the Roman road over the slopes of Monte Cimino to Cività Castellana. He will have glorious views on the way of Monte Soracte and the Apennines, edged with snow, and will be able to inspect the Palazzo Farnese at Caprarola, a magnificent example of a Renaissance palace, farther on the sombre yet deeply interesting ruins of Falerii, and beyond these the Etruscan tomb-chambers which flank the latter part of the road.

ILLUSTRATIONS

COMPETITIVE DESIGNS FOR A GRAVESTONE FOR LADY: SEVEN PLATES, SUBMITTED BY MESSRS. W. L. WELTON AND G. B. PIKE, NEW YORK, N. Y.; HOMER KIESSLING, BOSTON, MASS.; J. H. PHILLIPS AND C. RÖMER, NEW YORK, N. Y.; W. L. BERMINGHAM, KANSAS CITY, MO.; RIPLEY & RUSSELL, BOSTON, MASS.; J. V. VANDERBILT, ROCHESTER, N. Y.; J. G. DRAINIE, CINCINNATI, O.

In the belief that the publication of these designs might be found interesting, and with the hope that they might have an ameliorating effect on the desolating artistic poverty of mortuary memorials in modern American graveyards, we secured from the authors the best of the designs offered in an open competition a few months ago. The prize, one hundred dollars, was carried off by the design submitted by Messrs. Ripley & Russell.

HOUSE OF REAR ADMIRAL T. O. SELFRIDGE, 1867 KALORAMA AVENUE, WASHINGTON, D. C. MESSRS. M'KIM, MEAD & WHITE, ARCHITECTS, NEW YORK, N. Y.

Additional Illustrations in the International Edition.

"LAW" AND "JUSTICE": GROUPS AT ENTRANCE TO UNITED STATES COURT-HOUSE AND POST-OFFICE, INDIANAPOLIS, IND. MR. J. MASSEY RHIND, SCULPTOR, NEW YORK, N. Y.—TWO PLATES.

NOTES AND CLIPPINGS

THE LOUVRE—OLD AND NEW.—Parisians have just realized that the Louvre of to-day is far from presenting the impressive grandeur of the Louvre of old. The building, of course, is what it always was, but encroachments have played havoc with its effect. Perrault had surrounded it with fosses, which, since the beginning of the eighteenth century, have been covered in successively until all are gone. Recently M. Redon, the Louvre architect, has been led to examine the substructures, neglected for generations, with the result that they have been found to be in perfect preservation, and that their general effect was to form a grand outer base for the main building. The whole of the palace is now to be again freed from the sod to a depth of several yards, and a wide fosse will isolate it from surrounding roads. In the result the Louvre will again stand in the proud, clear-cut isolation given to it by Perrault.—*London Globe*

RECENT FINDS AT DELOS.—At a meeting of the Academy of Inscriptions and Belles Lettres lately, the American correspondent of that Section of the Academy, the Duke of Loubat, announced a sensational discovery of great archæological value in the Island of Delos, made by Professor Maurice Holleaux, consisting of six large archaic lions in marble, unlike anything hitherto found in Greece. Several houses in complete condition have been unearthed. In one house was found an inscription giving the precise dates of construction, the names, etc., also a statue of the muse Polymnia, analagous to but finer than the celebrated statue of the same muse in the Berlin Museum, and which is a replica of the work executed by Philiskos of Rhodes. The drapery of the newly discovered statue is described by M. Holleaux as equal to anything known in Grecian sculpture. Among the other statues excavated is a magnificent head, larger than nature, of Dionysius found in a temple recently explored. and it is regarded by M. Holleaux, who writes from Delos under date of August 17, as one of the finest existing in Greece. M. Holleaux also announces the discovery of the statue of a woman of great beauty, a great amount of fine pottery and ceramics, forty gold coins, many gold jewels such as were never before met with, including a golden image of Harpocrates, the god of silence, mounted on a gold ring. The discovery of these art treasures at Delos causes a great stir among the French savants, and M. Loubat has received the thanks of the Academy and of the French Government for his intelligent energy and his annual subsidy of $10,000, which enabled the French School of Athens under the direction of M. Holleaux during the past four years to continue the work which already yielded such splendid results.—*C. I. B. in New York Tribune.*

THE PASSING OF CALVARIES.—American painters, says the *Pilot*, are in despair over the decision of the Municipal Council of Lorient, which has decided to abolish the "Calvaries" in the cemeteries. The artists fear that, following the example of Lorient, other French towns will be deprived of this picturesque feature, and in time all the village and roadside crucifixes will disappear. The French peasant kneeling at the foot of the cross under sunlit or stormy skies has furnished many American artists with a subject for a picture.—*Boston Transcript.*

THE CHICAGO FREIGHT SUBWAY.—The transmission of the United States mails by the underground electric railway of the Illinois Tunnel Company was begun on July 1 last, and proved a success from the first day.

Originally the company, which to-day owns and operates forty-five miles of underground bores in the downtown business part of Chicago, was the Illinois Telephone and Telegraph Company, and as such received authority, by virtue of an ordinance passed by the City Council, February 20, 1899, to construct subways in which to install systems of telephone and telegraph wires. In 1903 a supplementary ordinance was passed, giving the Company permission to extend and widen the subways. Actual work of construction was begun on the system in September, 1901, by the Illinois Telephone Company, with George W. Jackson as general-manager and chief-engineer. After the work had been under way for some time, or about three years ago, the city authorities discovered that the original design of the Company had been departed from in a surprising measure, and that as a matter of fact wide tunnels, extending beyond the limits prescribed by the city ordinances, had been constructed and were in process of construction. There was a great hubbub, aldermen, City-hall officials and the local press joining in a hue and cry in denunciation of the tunnel company for its alleged "steal" of underground right-of-way. The wrangle continued for some time, but meantime the Company's engineers continued on with the work of extending and enlarging the tunnels. Finally, there was further legislation by the City Council, which was in favor of the corporation, the latter having agreed to render the city annual compensation in the nature of a small percentage of its future earnings when the tunnel should be in operation. The Company then changed its corporate name to the Illinois Tunnel Company.

The ingenuity of the engineer, who has planned and supervised the construction of the Chicago subway, has been taxed to the utmost by conditions confronting him, on account of the many styles of buildings that had to be tapped to make connections with the tunnel. No two buildings being alike, each has required its own treatment. Where the tunnel connects with a building whose basement extends only one story below the street grade, a turnout or by-pass was constructed leading from the main tunnel to the inside of the curb, where it was made to connect with a shaft leading to the basement under the sidewalk. Specially designed elevators lift the cars to the basement floor, where, with the use of a turn-table, they are shoved wherever desired. These elevators are tested to carry 30,000 pounds.

The most thorough lighting is furnished throughout the trunk tunnel, intersections, turnouts and building connections by electricity. Power for trains is furnished by a 5,000-horsepower generating plant.—*Exchange.*

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SOCIETIES, PERSONAL MENTION, ETC.

WHENEVER, as individuals, we are tempted to express amazement at the commonplaceness in design of matters that finally receive the approval of the various art commissions, we, as editors, at once recall that our own work ought, perhaps, to be valued mainly because of our refraining from publishing contributions actually rejected, and hence, we easily maintain a respect for their decisions. All that they, or we, can do, is to accept the best that momentary conditions make accessible, while doing all that can be done to reject the really "impossible." Just now, the Municipal Art Commissioners of both New York and Boston are "under fire," the first because they have had the audacity, in the face of favoring political pressure, to reject the design proposed for the Richmond County court-house, and the second, because they refuse to allow the erection on Boston Common of a, presumably "imposing," memorial to the late Mayor Patrick A. Collins, beloved of all of Irish descent and, to say the truth, respected by all good citizens of Boston. As we have every confidence in the architectural good judgment of "a man named Cook," as he is nominated by the supporters of the court-house design, we have not the slightest question but that the firmness of the architect member of the New York body has spared us the sight of another public building offensive in its misused architectural extravagance. In the other case we feel that the commissioners were absolutely right, for monuments should be allowed a place on Boston Common only when they possess the most unchallengeable permanent public significance, and that can hardly be claimed for a memorial to Mr. Collins. Boston has had many mayors as worthy of public honor as he. They have as many influential, or monied, admirers, and if each is to be honored in turn, the venerable Common would soon put on the air of an Italian "campo-santo." If the mayors must be honored, and if the Common only will serve for the display of their sculptural charms, then the old fence might better be restored, and its posts surmounted with their effigies in bronze, patterned after those little gems of art that make the railing about the Place du Petit Sablon in Brussels so interesting.

IF the criticism of the universal custom of holding architectural competitions, which may be found in another column, is the result of the individual observation of an intelligent lay observer, it is much better worth considering than if it were a mere restatement of the opinion of the last architect with whom the editor of the New York *Evening Post* had chanced to talk. Although the argument could easily be traversed in several directions, it agrees essentially with our own belief that competitions are very far from being the unmitigated evil their opponents would like to have them held. A competition always is a success from the winner's standpoint, and there never was, and probably never will be, a competition so well and fairly managed as not to be declared a failure by some, if not by all, of the defeated contestants. Very much is made by opponents of the system of the vast aggregated cost of the time and labor wasted in a large public competition, as if such waste were peculiar to architectural competition, instead of being the one common element in every field of human endeavor. At this moment the hotels here are full of "buyers" for the fall and winter trade, but the manufacturers who seek to secure them as customers do not think of abandoning their outlays for advertising, catalogues, salaries, commissions and wine suppers, simply because the aggregate outlay for these things by the manufacturers who have not succeeded in satisfying these buyers has been enormous. The aggregate loss of a number of real-estate agents all trying to sell the same piece of property is also large, just as is that caused by the futile manœuvring of many lawyers, each trying to secure the same client. If the lawyer, the manufacturer, the architect, the real-estate broker, object to the burden that bears more or less equally on all laboring men, the remedy is entirely in their own hands. It is wholly by their own volition that they enter competitions; each, if he prefer it, can sit quietly in his office and do only such work as comes to him through and because of his acquired reputation—if he has any.

THE practice of architecture would be delightfully smooth and ladylike, if jobs were handed out by personal selection to those who had "arrived." To be sure, it might be a little difficult for the public to know who had and who had not arrived, and we confess that we do not see how that all-important and significant fact is to be established. Has that man arrived who has practised twenty, thirty, forty years, but never accomplished a decent design? Has he arrived who has built an enormous number of dollars into artistically indifferent structures? Has the jolly good fellow arrived, the man with an endless fund of good stories, and known to be able to talk over to his point of view the most stiff-necked building-committee that was ever brought together? Perhaps. But when these men have joined the majority, where is the second line? Are there to be no more arrivals? The

Entered at the Post-Office at New York as second-class matter.

doctrine of direct appointment is, at least, as absurd as the theory of competitions. The way direct appointment is likely to work is shown by the case of the Richmond County court-house, mentioned elsewhere, for, of course, it is predetermined that such appointments cannot be intrusted to any architect or any advisory body of architects, for is it not the voice of clamor that no architect, or jury of architects, ever succeeds in fairly assessing the merits of competitive designs? How could they, then, possibly make a direct appointment that would satisfy more than the one man who gets the job? Does not the least satisfactory of competitions do as much as this? It always pleases the winner. Until the millennium has arrived, we are convinced that there is nothing so fair and satisfactory to the promoter, the public and the architect as the "compound" competition, as we have styled it.

WE would like to speak with the most delicate sympathy and feeling of the death of Edmund R. Willson, of Providence, R. I., for, to admirable qualities of mind, and a very real capacity as the creator of architectural designs of great merit, he added the charm of a very lovable personality. Born at Salem, Mass., in 1856, Mr. Wilson was able to take profitable advantage of the educational opportunities offered by Harvard College, the Institute of Technology and the École des Beaux-Arts, and for this reason alone deserved a place amongst the élite of the profession, and his performance later fully justifies his inclusion in such category. A year after his return from Paris he was made the junior partner of Messrs. Stone & Carpenter, of Providence, whose already enviable reputation he has done much to enhance during the last twenty-five years, for, owing to his facility as a draughtsman and the sobriety and delicacy of his artistic perception, his older partners soon acquired the feeling that an unusual share of the active designing might safely be left to his conscientious treatment. It would not be fair to his surviving partners to ascribe to him all, or even the main part of the credit for the many excellent designs which the firm has carried out in recent years, but they will gladly, we believe, subscribe to the statement that his influence in the firm's work has been paramount.

THIRTY years ago the New York or Boston architect audacious enough to be willing and affluent enough to be able to engage Theodore O. Langerfeldt to render in water-color a competition-perspective was quite generally believed to have secured, by reason of so doing, an infrangible lien on the award. Compared with prices paid in recent days Langerfeldt's charges were quite modest, but for those remoter and simpler times they were large, and, as he was always well employed, it became an accepted belief that he was rapidly accumulating a substantial capital. We sincerely trust that this was the case, for we have just learned that the unfortunate man has at length died, after an illness of ten years' duration. Not infrequently, Boston architects of late years have asked one another what had become of Langerfeldt, but no one could answer, and it did not seem to be any one's business to look him up and find out what was the matter. We have no good ground for supposing that he was not properly and tenderly cared for by some one, but there is a chance that he may have suffered through the negligence and carelessness of the profession at large. It may seem unjustifiable to give voice to such an assumption in a concrete case, and we do it only that attention may be drawn sharply to a common oversight. Architects and their associated helpers of one kind or another are "disappearing" constantly: it is generally known that they have not died, and so it is assumed that they have moved elsewhere, or have retired from business with a competence, whereas the real truth is that they have slunk away to some shabby hole to drag out in illness the last days of a broken and defeated career. This should not be allowed, and it seems to us it should be part of the routine work of the architectural societies everywhere to call the roll, as it were, every year or so, for the sake of making sure that no fellow-member or fellow-professional was suffering from hardships that a willing coöperation could so easily alleviate.

AT his best, Langerfeldt, as a water-colorist of architectural subjects, was superior to all contemporary—yes, even to all present—workers in his special field, while, as a water-color artist pure and simple, his work generally merited attention, and often won applause. Whenever he was able to accumulate enough landscape sketches to make it worth while to hold an exhibition, it rarely happened that the product of his brush was not snapped up by eager collectors, in spite of a certain hardness and particularity of treatment which is almost inevitably acquired by architectural water-colorists, through being obliged to force the detail of their drawings. His technique was excellent, and, as a rule, he eschewed body color. He was by birth a Hanoverian, having been born in Bruckeburg in 1840, emigrating to this country when he was sixteen years of age.

IT is beyond question that American architects are preparing to indulge in a "veritable orgie" of reinforced-concrete building, and to many a man who now has the idea of following this fashion we recommend a quiet consideration of *Punch's* famous advice. Building with concrete, whether reinforced or not, is an undertaking not to be attempted rashly, but prayerfully, and the petition for salvation should never be so iterant as when centres are about to be struck. Two fatal accidents within ten days —one at Elyria, O., the other at Mineola, L.I.—show once more the celerity with which a concrete building can dissolve. To argue that the automobile must be abolished, because, daily, the innocents are being slaughtered here, there and everywhere by speed-maniacs, would be as sensible as to urge legislation against the use of concrete. Properly handled, concrete and the automobile are potent factors in legitimate progress. But the architect who allows himself to use reinforced-concrete without having given to the material and methods such serious study as will justify his belief that he has actually mastered them, the architect, that is, who is willing to "take chances" with the lives of mechanics and the capital of his employer, should be held entitled to full membership in the criminal classes.

DESIGN AND THE CHOICE OF MATERIAL.

WHAT would be thought of a goldsmith who labored long and lovingly at a hoped-for masterpiece, and then left it for the decision of the purchaser whether the work should be used as a setting for brilliants, pearls, or jade? Or, to give a more common-place instance, should we expect a woman to choose a pattern for a gown, and then leave to the determination of cost and expediency whether the material should be silk, lawn, or calico? Such examples as these of the utter disregard of congruity between design and material are almost unthinkable. But, every day, architects of the highest rank and of the utmost refinement of taste are called upon to confront just such a condition. They furnish a design for some great building that might be their masterpiece, and serve to keep their names alive in the annals of their art. The disign is approved, and calls out delighted comment. Then it is handed over to the specification-writers, and the estimators are called upon to furnish "alternative bids" in granite, marble, or limestone. The man who gives the commission, or the building-committee, if it be a public structure, decides by the item of cost, the time-limit of construction, or even through "wire-pulling" and "influence," which material shall be used to embody the architect's conception. No one would deny that the architect's opinions sometime carry great weight, and that a few builders (using this term to designate those for whom the structures are to be erected) are guided by considerations of art and fitness. But still dollars and cents and days and weeks play an extremely important part in all building operations. Hardly a day goes by without contributing an instance of some notable building, originally contemplated in one material, being changed to another through influences of expediency rather than congruity. That American architecture has reached a high plane under so manifest a drawback is surprising. It is certain, however, that our architects will never show the full fruition of their genius until they are freed from this incubus; until they are allowed absolute discretion in the adaptation of design to material.

This is not intended in any way as a plea for the use of the more expensive materials of construction. No architect need be hampered by any fair limit of cost. But he should not be led to design for marble, and find himself interpreted in limestone. Nor should he be tempted to display the exuberance of his fancy in decorations fittingly to be carved in a free-working stone, only to have his creations afterwards marred by an attempt to render them in hard, unfeeling granite. Nowhere can better materials of construction be found than in the United States. We have building granites, marbles, limestones and sandstones that cannot be excelled anywhere. There is no design that cannot be fittingly interpreted, providing that the architect adapts the design and ornamentation to the limitations of a single variety of stone. To ask him to put the material wholly out of mind, and to make his design flexible enough to stretch equally well to any stone, is rank philistinism. It is the extreme limit of "bargain-hunting." Unfortunately, the National Government, so progressive in many ways, is the chief offender. States, counties, and municipalities follow close behind, and rarely miss an opportunity to "shop around" for bargains in stone.

How much the artistic effect of the great buildings of all time depends upon the exquisite adaptation of material to design is familiar to every student of architecture. We may be sure that the happy combination was not secured by chance, and that the buildings were not conceived and planned in ignorance of the structural material that was to be used. Does anyone believe that those who reared the Parthenon would have wrought in the same fashion if granite or sandstone had been the only quarry product at hand? We may go even farther, and ask to what extent the architectural art of the ancient world was inspired and modified by the nature of the building material that was available. It is a fruitful subject for investigation. Greek and Egyptian architecture and sculpture are as far apart as the poles. We are taught that this is because of the nature of the people, the state of their civilization, their religious beliefs, their philosophy of life, etc. But has there not been an ignoring of physical conditions? The Greeks wrought in free-working stone, and had the brilliant marbles of Pentelicus, Paros, Thasos and Naxos to call out their most delicate fancies. The Egyptians, on the contrary, worked largely in the sombre and intractable granites, syenites, and porphyries. Who can tell what modifications there would have been in the architectural styles of each of these peoples if there had simply been a substitution of the rock formations of one country for those of the other?

In a general way, there is a widespread recognition of the fitness of various stones for certain purposes. The judgment of the ages has fixed upon granite for structures in which the key-note is solidity, strength and dignity. Marble is the material necessary to carry out the Classical style in its purity, while any form of light-colored freestone is suitable for highly decorated and flamboyant architecture. Every architect naturally seeks to work within these bounds and limitations, unless he is hampered by the "alternative bid" system. But it is when he goes deeper than these general principles, and gives close and detailed study to the capabilities of every variety of stone, that the architect secures the most perfect result in the carrying out of his designs. He recognizes that half a dozen qualities besides mere manual ease in carving, have an important bearing on the finished ornamental work. He rejects a hard, tough granite for a façade requiring a mass of delicate carving, not only because the cost of cutting would be prohibitive, but also because the nature of the stone is such that, even if the work were done, the effect would be wholly unsatisfactory. The qualities in a stone that must be taken into consideration in judging its adaptability for particular work are texture, hardness, life (not durability, but liveliness), and color, the above enumeration being, perhaps, in the order of their importance. The word texture (at first glance seemingly inappropriate in this connection, as it comes from the Latin *texere*, to weave), as applied to stone, means the manner in which the various constituent mineral particles are united, and incidentally takes into account the size, shape and nature of the individual particles. No science has a more extensive and confusing terminology than geology. Scores of terms are used to describe the minute variations of rock structure, but it is enough to consider the building stones under the broad classification of crystalline and fragmental. The crystalline structure of the granites and limestones varies almost infinitely. We roughly distinguish these stones as fine, medium and coarse-grained. For the purpose of considering their fitness for architectural use, it is desirable to employ two more scientific terms. A saccharoidal formation is that in which the grains and structure are similar to loaf sugar. This is common in the crystalline limestones classed as marbles. Porphyritic rock is that which consists of a compact or fine crystalline ground-mass, through which are scattered larger crystals. Granite very frequently assumes this formation. It needs no argument to show that the saccharoidal structure is most suitable for work where the *motif* of the carving or decoration is delicacy and grace. On the contrary, these qualities would instantly be sacrificed if an attempt were made to render them in a stone of porphyritic formation. Here the only qualities that can be expressed are strength and solidity, and the decorative features must be conceived along the line of boldness and vigor. To carry the idea still farther, these features of a stone have weight, even in plane, flat surfaces. If a fine-grained, pure, white marble is used for wide, unbroken wall-spaces, and is left in the smooth, sand-rubbed finish so much affected, the result looks like a bit of plaster-work or a confection by a caterer wrought in sugar. This is in large measure obviated if the stone contains the blue veins and cloudings natural to a true marble. These are generally barred out, because there is a craze for "white" buildings. The effect can also be avoided by a tooled finish, but the better way is to make use of a marble of coarse crystallization. In contradiction of this *dictum*, someone may point to the Classical buildings of Greece, in which the fine-grained Pentelican marble was used for large, smooth surfaces. But the Grecian marble has a distinct cream tint, and there is a peculiar translucent quality that we cannot match in any of our stones. Besides, who shall say that it was not a desire to avoid a plaster or sugary effect that led the Classical builders to make so free use of pigments in staining stonework?

Stone of very coarse grain, or of porphyritic formation, does not give any appearance of dull uniformity in unbroken surfaces, and its use is suggested in all such cases, where possible. But it is completely out of place where it is often seen, in buildings made up of small wall-spaces, like narrow window-piers. Here it looks as if shorn of its most vital quality, strength.

The second variety of rock formation to be considered in this connection is the fragmental, as this manifests itself in the granular or oölitic form. The granular structure is that of all the common sandstones. In some of the sedimentary rocks, the grains are so minute, and the texture of the stone so compact, that there is scarcely any appearance of granular structure. Stone of this nature, however, is so rarely used in the building trades that it may be dismissed from further consideration. The oölitic formation is most familiar in the Indiana limestone, and the trade application of the term is limited solely to this and kindred varieties of stone. Most of the sandstones and the oölites come

within the category of freestones. The texture is nearly always fine and even, and consequently they are, in the main, suited for delicate and elaborate ornamentation, save as there comes the modification of color, to be spoken of hereafter. In the granular and concretionary, or oölitic structure, the constituent mineral particles are held together by a cementing material, which is dull of color. Thus, there is never the liveliness shown by the crystalline rocks. There is none of the play of light that comes from the facets of a crystal, and that is never completely lost, even though the exposed surface of the crystal be smoothed by the rubbing-bed. For this reason the natural treatment suggested is that ornamentation be carved in greater relief than in a crystalline stone, so that there may be the play of light and shade from without. It also suggests that in plane surfaces the stone always be tooled or left in rock-face, unless there is warmth of color. The ordinary grays, blues and buffs of freestone, if sand-rubbed, are as dull and lifeless as concrete, and the architect might better give the preference to the cheaper material. The pink, red and brown stones, however, are best shown in plane surfaces, smoothed, with sufficient moulding and simple ornamentation to prevent severity. In the very dark stones carving loses the greater part of its effect, unless it is wholly in the round, like pinnacles, finials, crockets, etc., owing to the indistinctness of the shadows. Of course, this is not true of the light reds and pinks. But all of the color is due to the presence of mineral ingredients that tend to hasten disintegration if exposed surfaces invite the entrance of moisture. Besides, wise restraint is the soul of art, and rich body-color and elaborate ornamentation rarely harmonize in architecture.

One quality of the freestones that particularly fits them for ornate and highly-wrought carving is difficult to put into words. This is not the mere ease of working, but the direct and delicate response to the chisel, so that the finished surface might almost be called the autographic record of the artisan. There is an individuality that can be had in nothing else save the finest of the marbles. This it is that makes it possible to carve architectural statuary in a stone that has little natural life, and yet that does not show a hard, unfeeling result. One has but to glance at the many caryatides and atlantes carved in granite and limestone on our city buildings to see how the former stone yields in beauty and effectiveness to the latter for work of this nature.

In certain varieties of ornamentation it is particularly desirable to make the tool-marks plainly manifest. One of these is the Celtic pattern, and another is vermiculation. The reason for the desire to retain the tool-marks is that there shall not be too much regularity in the ornament, but that it shall look, in the first instance, as if the design were made separately by actual braiding, and then applied; in the second case, the desire, probably, is to simulate the work of worms. When the ancient Celts used the braided work for their famous crosses, they did not employ any of the fine native granites for the purpose, but rather the Irish limestone. This was not for ease of working, for it cuts as hard as many granites. It is a dense crystalline stone, of a fossiliferous nature. It is a dark blue-gray in the fractured surface, but a peculiarity is that it tools almost white, and the light tool-marks never fade away to the original color of the rock. A stone of an identical nature is found in the central part of New York State. The use of such a material would permit of artistic effects where a marked contrast is desired between the worked and the unworked surfaces.

Every city in the country can show scores of instances where no attention has been paid to the above very obvious limitations of structural stone. In few cases is the fault due to a lack of perception on the part of the architect. What chance had he to adapt his design to the material, when at the time of drawing it he could not tell how much his patron would be swayed by questions of cost or time? He must either trust to chance that his design will find a fitting material, or try a compromise with his artistic instincts, always a dangerous expedient. One of the handsomest and most elaborate buildings in New York has a profusion of ornamentation in the form of festoons and bosses, all rather ponderous and heavy in design. This was evidently conceived with the idea that it would not be ruined if carved in either granite or marble. As a matter of fact, the stone finally chosen was one of the most delicate and fine-grained of American marbles. The nature of the stone would admit of the most exquisite refinement in carving, and it stands out as an opportunity wasted. Another building has panels and spandrels filled with sculptured figures and the most delicate floral designs of the later Renaissance style. But it is in granite, fortunately, of a fine, uniform grain and of light color. It is a superb example of stone-carving in itself, but the figures, especially, have the hard, repellent look that must always follow any attempt to render the human form in a material which is not fully responsive to the chisel. The artistic effect would have been superior, and the cost far less, if the design had been carried out in marble or any light freestone.

The above discussion of the limitations of the various stones used for structural purposes clears the way for a suggestion of the general principles underlying the adaptation of design to materials. There is no pretense that the matter is to be settled by the *dicta* of any man, and this claims to be nothing save a contribution to a subject that has been strangely neglected. Reduced to briefest form, I conceive the natural treatment of our building stones to be as follows: For coarse-grained stone, of light color, bold and vigorous ornamentation, simple mouldings, and large plane surfaces are most suitable. Fine-grained stone, of soft and even texture, liveliness and light color, calls for ornamentation of classical delicacy and refinement, with flat surfaces tooled. Light-colored freestones are most effective with elaborate ornamentation, carved in high relief, and with flat surfaces invariably tooled. All dark or highly-colored stone should have rubbed or hammered surfaces, and few and bold ornaments and mouldings.

Painters work with oils, water-colors, charcoal, or pastel, but they never seek to over-ride the limitations of their *media*, unless they are faddists or seeking cheap sensationalism. Americans who commission architects should be forced to a realization that the limitations of structural material are far more rigid. No considerations should be weighty enough to justify a disregard of them. Architects must be unfettered by sordid considerations. In the good time coming no finished design will be drawn, even at Government dictation, until the general nature of the structural material to be employed is irrevocably determined.

FRANCIS W. HOYT.

THE USE OF BURNED CLAY PRODUCTS IN THE FIREPROOFING OF BUILDINGS.[1]—III.

NEXT in importance to the protection of steel stanchions comes the matter of girder-protection (and for a better understanding between us, allow me to say that the word "girder" used herein is intended to refer to the beams resting directly upon stanchions, whether the latter be of steel or brick). Girders are of various form and size, from the single I-beam used in the ordinary mercantile structures to the great box-girder such as is used in the proscenium-walls or the roofs over the stages of theatres. The flanges of girders always admit of tiles being very firmly secured between them by cement joints, being forced into place between the flanges. But soffit tiles for the exposed bottoms of girders often require mechanical fastenings if the girders are wide. These fastenings, however, are never left exposed, but the sections are such that any metal used is covered with a tile. Approved sections of fireproofed girders are shown in Figs. 2, 5, 7, 8 and 9.

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The above-described details cover only a few of those now in regular use, but it is hoped that they may serve to illustrate the main features of the system. The illustrations are mostly copies of working-drawings of executed work showing many other details of construction which I will not attempt to describe.

A system of burned-clay fireproofing which is used to a large extent in the United States, but not so generally as that before described, is that known as the Guastavino system. It was introduced by Rafael Guastavino, an architect, who came to America from Barcelona, Spain, in 1878. It would take more time than I have to spare to describe the principles involved or the details of this construction. It is called by him "cohesive construction," and all the work is done with laminations of small flat tile about 6x10 inches in size and ⅞ of an inch thick, laid in as many courses as may be necessary in Portland cement, breaking joints, and seldom more than four courses in thickness. It dispenses very largely with steel, and except where used in place of a steel girder all flat surfaces are spherical, no barrel-arches being used. It is therefore monolithic and homogeneous. The ultimate and highest expression of this system of construction has been shown in the building of large and, often, very flat domes. But it is principally used for floors and roofs.

In all tests that have been made its fireproof qualities have been proved, and in the conflagration at Paterson, New Jersey, a few years ago, it went successfully through several actual tests in buildings. The architects of the United States feel greatly in-

[1] A paper by Peter B. Wight, F.A.I.A., Editor of "Fireproof Magazine," presented at the International Congress of Architects.

debted to Mr. Guastavino for introducing and practising his system, for it has made possible many accomplishments in novel design which might not otherwise have been carried out. It has been in use for twenty-eight years without failure or accident. Though not now protected by patents, no one else has ever attempted to do similar work, that I know of, except in one instance of a vaulted church ceiling. It is a method that requires trained and expert workmen, as well as an accomplished head to direct

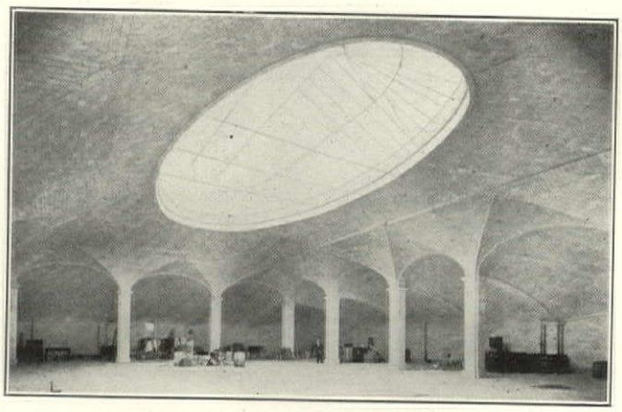

FIG. 19. INTERIOR OF THE EXHIBITION ROOM, COVERING THE ENTIRE TOP STORY OF THE TIFFANY BUILDING, NEW YORK CITY. GUASTAVINO SYSTEM. EXECUTED IN ENAMEL TILES.

them. Mr. Guastavino and his son plan and direct the work. He is an architect of reputation in his native country, but gave up his practice shortly after he came to the United States. The illustration herewith presented is a halftone from a photograph of a floor in the Tiffany Building New York City (Fig. 19).

The principles embodied in the Guastavino system have been put in practice in one of the largest storage warehouses in the world, that of the Pittsburgh Terminal Warehouse and Transfer Company, at Pittsburgh, Pa. In this building the unit of floor-construction is a panel 20 x22 feet, the floors being supported by steel stanchions at these distances. The short spans between the stanchions are supported by 18-inch I-beams, and the long ones by 24-inch I-beams. Short 8-inch I-beams set diagonally near the stanchions form diagonal square platforms, from which are sprung four arches of 6-inch hollow tiles to the center, with a rise of only 17 inches. The four sections meet at joints where 8-inch cambered I-beams are set as guides, these being sprung from the girders and meeting at the crown of the arch. This makes a domical construction, the haunches of which are filled with concrete to make a level floor, which is finished with cement. (See Fig. 20.)

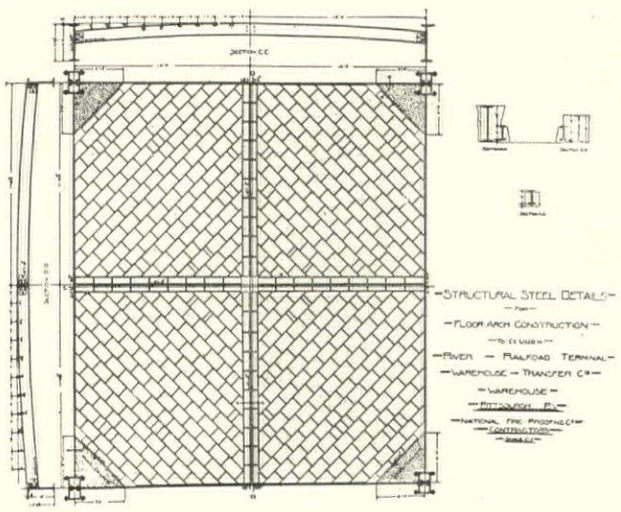

FIG. 20. PLAN AND SECTIONS OF ONE FLOOR-PANEL, SHOWING CONSTRUCTION OF THE PITTSBURG TERMINAL WAREHOUSES, PITTSBURG, PA.

I have only to refer to one more of the many uses made of hollow clay tiles in this country, and that is an extensive one, though it dates only about six years back. This material is causing a revolution in the method of building grain storage houses, called in the United States "elevators." The reason for the use of that name is not generally understood, and can be explained in a few words. All the grain that enters these structures is carried by machinery to the house on top, called the "cupola," and there distributed to the bins, which hold from 20,000 to 80,000 bushels each. When it is removed it is taken out at the bottom and then "elevated" again to the top, to be delivered through chutes to boats or cars. Hence it is all "elevated" twice. Formerly the bins were built of solid wood, by nailing 2 x 6-inch scantlings on top of each other, on the flat sides, like bricks in a wall.

The first engineer to plan these elevators in the United States was George H. Johnson, now deceased. Though he was a native of England, his inventions were all made when he was in America. The old form of grain elevator, surrounded by brick walls and sometimes only with sheet-iron, and bins enough to hold from 500,000 to 2,000,000 bushels, was his invention. The system was introduced at Manchester about eight years ago, long after his death. He had in two cases built the bins of brick and circular, reinforced with iron insertions, but they were too expensive to repeat.

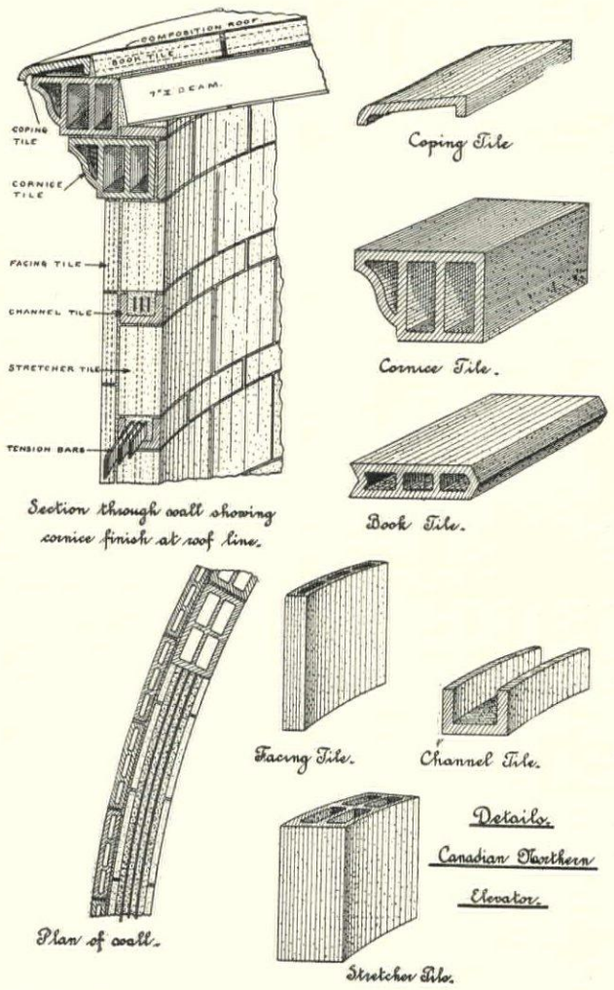

FIG. 21. DETAILS OF HOLLOW TILE GRAIN TANKS AS BUILT BY E. V. JOHNSON, ENGINEER.

It is therefore natural, in the course of events, that Mr. Johnson's son, Mr. E. V. Johnson, should have perfected in permanent fireproof materials the elevator construction that his father initiated. The first test was on a single bin at Minneapolis, to contain 20,000 bushels. He built it of hollow clay tiles, reinforced with steel bands set edgewise within the tile wall, filled it with wheat and tried to destroy the grain by building a fire against it. He did not succeed in the latter purpose, and the result has been that up to the present time there are probably one hundred million bushels of grain stored in tanks of similar kind which have since been built, and nearly all of it is uninsured. It is hoped that a few illustrations will show how these "elevators" are constructed. (Figs. 21 and 22.)

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It must now be evident to the hearer, as it is to the writer, that the subject of this paper is such a vast one that it is impossible to comprehend more than an outline of it in this effort. I have not troubled my hearers with statistics or told of the great and costly structures in which the American system of fireproof construction has been used for the past twenty-five years; nor have I

descanted upon its effectual saving of the structural parts in the Baltimore conflagration, or the part which it has borne even more effectively in the recent San Francisco disaster, notwithstanding much that has been said to the contrary. These are matters of history. Nor have I claimed for it absolute perfection. Like all the other efforts of mankind, it is still in evolutionary development. It is an art which is not practised with equal conscientiousness by all. The material of which I speak has too often been used as a sham and pretense to mislead the victims of the greedy impostor into a sense of security for which there is no reason. More than one burned building has proved this. But

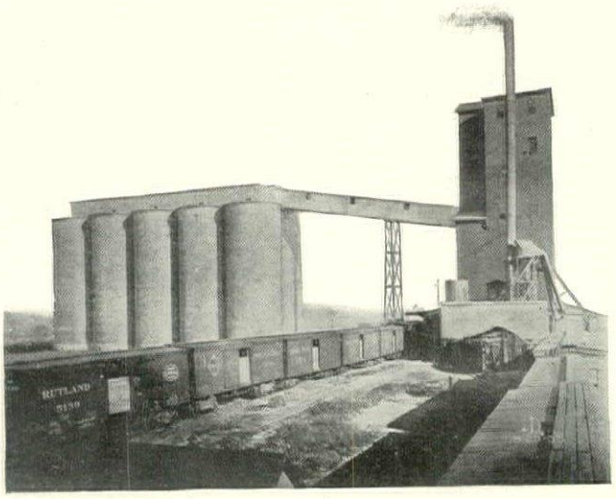


FIG. 22. GRAIN TANKS AND ELEVATOR BUILT BE E. V. JOHNSON AT SOUTH CHICAGO, WITH REINFORCED HOLLOW TILE. THE ELEVATOR, WHICH WAS NOT FIREPROOF, HAS BEEN DESTROYED BY FIRE, WITHOUT ANY INJURY TO THE TANKS.

more than a hundred others have been saved from fires in their early stages that would have been wholly destructive in buildings of the ordinary class.

I venture also to say that the fireproofing with clay products is in no country impracticable on account of added cost. The fact that the earliest inventions in this material were in Great Britain and on the Continent, were not developed and put in practice in those countries, but in one across the sea, is no argument that they have been tried and found wanting. If the manufacture should be more expensive at first than in the United States this would only show that improved methods and machinery, there used, are here unknown. In my opinion this fireproof material, as made in the United States, could, after less than one year's experience, be made cheaper in England, or France, or Italy, than on the other side of the ocean, with its high-priced labor and coal. It is a large product and must be made on a very large scale. It must also find cheap transportation. I do not think that the American manufacturers are anxious to send their product to Europe, though I know that it has been shipped from New York to London at less cost than it could be transported by a short railroad line in England. I think that American contractors, whose spirit and enterprise know no bounds, would much prefer to buy or make their materials in the countries in which they find contracts to execute, than to carry them away from home where they have plenty of use for them. It is matters like this which seem to me to be especially pertinent to an international congress of architects. We are here to learn what others are doing; and while we learn from others we are endeavoring to impart that information which we happen to possess to our brothers in other lands, which we hope will be useful to them. It is for such reasons that I have endeavored to contribute what little I can to the fund of information to be here accumulated for the benefit of our confrères throughout the world.

A LAY EDITOR ON ARCHITECTURAL COMPETITIONS.

THERE is considerable discontent in professional circles with the prevailing habit of architectural competitions. The dissidents take the view either that competitions are clumsily managed and unfairly judged, or else that they are uneconomic and vicious in principle. Representing the first class, a prominent architect asserted in the last general meeting of the Institute that Mr. C. F. McKim's sketch plans for the University Club would never have received an award in a competition. The statement was undisputed, and certainly indicates that there usually is something amiss with the programmes, the judges, or the competing architects. The smaller class which regard competition not only as subject to perversion, but as unjust *ab initio*, offer a plausible but not wholly convincing moral argument for their case. It is illustrated in a clever skit by Mr. Henry Rutgers Marshall, in last month's *American Architect*, in which he imagines the Architectural League proposing a competition among lawyers in order to choose its solicitor. The fairly grotesque terms, the inadequacy of the reward, etc., are borrowed with the slightest alteration from the programme for the new buildings of Union Theological Seminary. The inference is that such a competition is an affront equally to the legal and architectural professions.

The moral objection may be more concretely stated as follows: Ten established firms are invited to enter a competition for a million dollars, being promised a thousand dollars apiece as indemnity for the expense of preliminary designs. But the regular fee for preparing such designs would be in every case one per cent., or ten thousand dollars. In other words, the Building Committee receives, in nine cases, at a thousand dollars, a service worth ten. This argument, however, is too mathematically good to be true, and falls to the ground when it is recalled that no architect can be compelled to enter a competition. The system could any day be defeated by an agreement of the best firms to stay out. On the other hand, it should be noted that established firms do compete under protest, with a sense that the method is very defective and subject to grave miscarriages of justice.

Into the matter of log-rolling, playing up to the taste of influential members of the jury, we will not go, because these are defects inherent in any such rivalry. If the profession of architecture is worse off in this respect than the others, it behooves the authoritative bodies to assume a severer attitude towards unprofessional conduct. There is, however, much to be said against a system that uneconomically brings out, say, fifty designs where a single building is required, and tends at least to eliminate the best firms and leave monumental buildings to be scrambled for by mediocrities. But all this is largely a matter of methods. Because invitation competitions are insufficiently paid is not a reason for abolishing them, nor is the frequent holding of open competitions, where limited contest would be advisable, a cause for despair. What we want is clearly a class of advisers and judges, such as actually exists in France, capable of drawing up simple and rational programmes, beyond personal influences, and fully aware of the mere tricks of the draughtsman which would pass for substantial design. In short, the most serious criticism of competitions among us lies not so much against the system itself as against the average committee and jury.

When it is remembered that young architects almost always commend the system, changing to the other opinion only after they have "arrived," it will be felt that the practice has at least the merit of encouraging rising talent. For this reason alone we should be sorry to see the admittedly uneconomic open competitions wholly done away with. We feel that it is unwise to trust to the hazard of such a free-for-all any very important building; but there is a whole class of smaller structures of a public or semi-public character where open competitions seem eminently in place. With respect to the greater commissions, we can only say that it is absurd to expect a firm that is prospering to encounter unpaid the chances of a large field; furthermore, that it is unfair to ask such a firm to compete, without at every stage fully repaying the costs of competition. Experience has taught, too, that in most cases the best results are obtained without competition by selecting the architect directly.

But right here appears the human and unprofessional side of the problem. An individual may fairly succeed in picking his man, but the great buildings are rarely in the hands of individuals. A corporation, lay or ecclesiastical, will practically have the greatest difficulty in making an impartial choice. As many competent architects may be in sight as there are stockholders or pew-owners. When the rebuilding of St. Thomas's Church was broached, it was found that some forty architects had substantial backers in the parish. Under such circumstances, what is there for it but the Apostolic method of casting a lot, or else some form of competition? It

was undoubtedly this motive that led the Commune of Florence in the old time to put out so many of its monuments at competition; and the same solution is likely to be sought whenever direct choice of an architect seems impossible.

By a natural misapprehension of the scope of competitions, they have been criticised as a bad way of selecting a building. As a matter of fact, they never are a way of selecting a building. The artfully tinted drawings that win the suffrages of juries have the very slightest relations to the building that is to be. At best, they are merely an indication that the winner of the competition will work out an acceptable building. As a method of choosing an architect—the real difficulty for building-committees—there is much to be said for competitions. They afford, if frequently a lame conclusion, at least a conclusion where otherwise there might be an interminable deadlock.

Looking at the situation broadly, the following advice might be tentatively offered to clients: (1) Choose an architect directly if you can; (2) for a monumental building, hold a limited and properly paid competition, if you must; (3) for an ordinary building, hold an open competition, if you will. Finally, architects will probably have to put up with a system generally unsatisfactory from a professional point of view, so long as it affords an obvious convenience to that soulless but indispensable entity—the average corporate client.—*New York Evening Post.*

THE ABBEY OF ST. DENIS.

WHEN place and street in front are empty, St. Denis carries off its fallen fortunes with something of dignity. But as I last saw it, on a spring day, when the new conscripts of the year had gathered just outside, dancing, singing, buying big paper rosettes, not one with a thought or a glance to fling to it, the church struck me as being only in the way, useless, out of gear with the new life that had grown up about it, preserved entirely from sense of duty. It looked to me forlorn, with its one melancholy western tower; with the restorer's work half done on the exterior—not that I am not glad the work is only half done, but that it should be is exceptional in France, where restoration is so often overdone—with the long, rank, uncut grass in the inclosure to the north of the nave; with the mean houses shutting in the east end, and where care has been given, it is to mark it more unmistakably as the *"monument historique,"* the mere survival, its real life long since spent.

The fine interior, so like and so unlike Westminster Abbey, has virtually become a museum; the royal tombs, reached by that picturesque wide stairway to the ambulatory, suggest in their neat rows so many specimens, labelled and catalogued. One cannot see without emotion tombs like that of the good King Dagobert—great, too, though best remembered for the affair of the breeches in the song—of Louis XII, Henry II, Francis I, with their beautiful sculptures; of the last of the Bourbons, with their bitter memories. But to follow the sacristan as he drones out the story learned by heart and repeated until his very voice betrays his boredom with the whole business of royalty, alive or dead, is to see in St. Denis nothing save the show place for tourists.

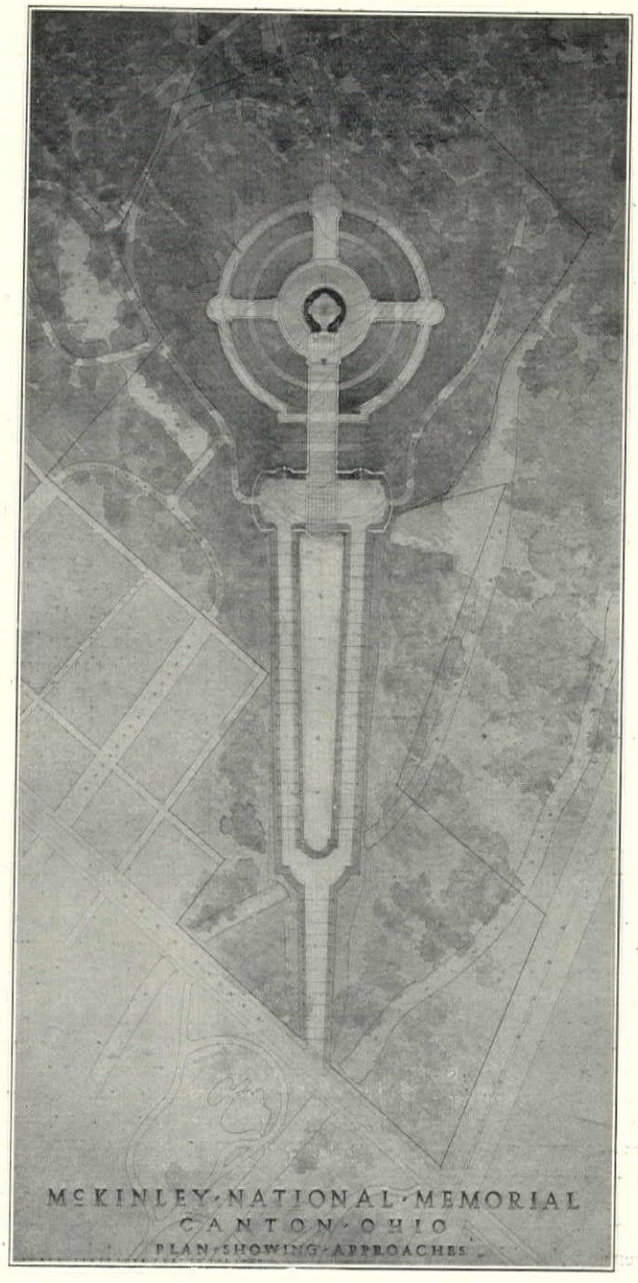
And this is the church that not even Notre Dame can outrival in the sanctity or splendor of its past, its site chosen by the holy man who was first Bishop, first martyr, first saint of Paris; the building founded by Ste. Geneviève, whose first chapel over his grave grew eventually into the church of which the Abbé Sugar made the first experiment with the pointed arch on so large a scale—the first great Gothic church; St. Denis, the shrine of the oriflamme of France; the Louvre, or Versailles, of dead royalty.

And so it remains, only a Louvre or a Versailles, shaken by the storm of liberty, equality and fraternity. Patriots of 1793 had no more use for dead royalty in its tomb, than living royalty in its palaces. And after "Patriotism had been down among the tombs rummaging," had played ball with the skeletons of kings—having to stop to hold its nose when that worst of old enemies, Louis XV, appeared, suffering a relapse into royalty before the embalmed body of that old favorite, Henry IV—after royal bones and royal ashes had been dumped into one unroyal common grave, after royal tombs had been broken and royal statues mutilated, there was not much left of St. Denis. But, defaced, roofless, a haunt of birds of prey, it was at least an eloquent monument to the hatred of the third estate for kings and priests. After the tombs—or so much of them as could be—were brought back by Louis XVIII, after new noses and hands and draperies were found for the poor, dishonored effigies, after the building was roofed in, its walls mended and everything generally put to rights by indefatigable Viollet-le-Duc, St. Denis was doomed to awake no feeling stronger than curiosity in the tourist. It is the irony of fate that royalty, dead forever in France, should rest not in the capital, nor in the cathedral, but in the parish church—to this rank has St. Denis been degraded—of a busy industrial suburb, the headquarters of anarchists, where the people who killed it are too busy to remember, much less to resent, the presence of its tomb among them.

There may be other places of interest in the suburb of St. Denis. I never looked for them. I am content with my last impression of it—with wide streets of dull shops and electric trams, with groups of conscripts, with gaunt factories, with chimneys belching smoke, and with the sad old church, the last resting-place of the royalty France sacrificed a century ago, that just such a busy industrial town might live and prosper.—*Century Magazine.*

ILLUSTRATIONS

MEMORIAL MONUMENT TO PRESIDENT M'KINLEY, CANTON, O.
MR. HAROLD VAN BUREN MAGONIGLE, ARCHITECT, NEW YORK, N. Y.
CROSS SECTION THROUGH THE SAME.
PLANS OF DOME OF SAME.



SARCOPHAGI IN THE SAME.
SCULPTURAL DETAIL OF THE SAME.
INTERIOR DETAILS OF THE SAME.
INTERIOR DETAILS OF MORTUARY CHAMBER IN THE SAME.
U. S. COURT-HOUSE AND POST-OFFICE, INDIANAPOLIS, IND. MESSRS. RANKIN & KELLOGG, ARCHITECTS, PHILADELPHIA, PA.—GROUPS IN FRONT OF THE SAME. MR. J. MASSEY RHIND, SCULPTOR, NEW YORK, N. Y.

Additional Illustrations in the International Edition.

WAREHOUSES OF A. WERTHEIM, BERLIN, PRUSSIA. HERR A. MESSEL, ARCHITECT.

This and the following plate are copied from *Zeitschrift für Bauwesen.*

INTERIOR TREATMENT OF LIGHT-SHAFT IN THE SAME BUILDING.
TWO BAYS IN LEIPZIGERPLATZ: SAME BUILDING.

These subjects are copied from *Blätter für Architektur.*

EVANGELICAL CHURCH, DEUTSCH-EYLAU, PRUSSIA.

This plate, also, is copied from *Zeitschrift für Bauwesen.*

NOTES AND CLIPPINGS

WATER ON TROUBLED OIL.—The principle of the rifled gun has recently been applied to pipes for pumping oil. The crude oil of California is mostly thick, viscous, and difficult to pump through long lines. Heating cannot be successfully applied to a long pipe, and mixing with water results in an emulsion from which the oil cannot be readily separated. The latest scheme for dealing with these viscous oils comprises a pipe rifled on the inside, so that the oil, mixed with about 10 per cent. of water, is caused to whirl rapidly. The water, being heavier than the oil, seeks the outside, and forms a thin film, which lubricates the pipe for the passage of the oil. The friction is thus so far reduced that the oil has been easily pumped through a line thirty-one miles long. The water and the oil come out entirely separate at the end of the line.—*Youth's Companion.*

THE SUN AS AN ARCHÆOLOGIST.—The sun, according to *The Dundee Advertiser*, has revealed an interesting scientific discovery which will delight the archæologists of the entire country. At Castle Park, Colchester, as elsewhere, the great heat of the last few weeks has considerably modified the natural greenness of the grass. But in one place there were noticed parallel and transverse bands of grass which were much browner than the surrounding verdure. Closer examination showed that the brown bands formed the ground plan of a spacious Roman villa. The shallow soil over the ruined walls of the villa had been dried more thoroughly than the deeper soil on either side of them.

FINGER-BOWLS AND MOSQUITOS.—Because she had not screened a finger-bowl with the regulation eighteen-mesh wire, Mrs. R. L. Arnold, a well-known New Orleans water-color artist, will have to answer in the Recorder's Court for alleged violation of the now celebrated cistern-screening law. Inspector A. G. Young, acting for the local Board of Health, made the affidavit, and an hour later Mrs. Arnold herself appeared in court with the finger-bowl. She uses the receptacle to wash her paint-brushes, and it is nearly always full of water. The inspector stated that he visited the artist's house, and upon examination he found that the bowl was unscreened, and contained several "wiggletails," or baby mosquitos.—*New York Herald.*

CATHEDRAL AREAS.—The Cathedral of St. John the Divine, now building in New York, will be the fourth largest in the world, says Canon Jones in the *World's Work*. St. Peter's, Rome, leads with an area of 227,069 square feet, little less than double the floor space of the next largest church, the Cathedral of Seville, in Spain, which follows with 124,000 square feet. The third place is taken by the Duomo, of Milan, which spreads over 107,000 superficial feet. St. John the Divine covers 99,500 square feet and will take the fourth place among the sanctuaries of the Christian world. Some other areas are as follows: Cologne, 91,464; St. Paul's, London, 84,025; York, 72,860; Amiens, 71,208; St. Sophia, Constantinople, 70,000; Chartres, 68,260; Lincoln, 66,900; Winchester, 64,200; Notre Dame, Paris, 64,108; Winchester, 61,729.

BURIAL-PLACE OF LEONARDO DA VINCI.—Two committees representing the cities of Florence and Paris are about to make a fresh search for the burial-place of Leonardo da Vinci. The actual search is to be undertaken by a body of scientists and artists selected by King Victor Emmanuel. The great artist died in 1519 at Amboise, where he had for a long time fixed his residence, and the house in which he lived, in close vicinity to the castle of Amboise, is still shown.—*Exchange.*

THE SULTAN'S TREASURES AND THE CASUBA.—In spite of pilferings, the imperial treasury at Constantinople must contain treasures of inestimable value. Some, but only a small proportion thereof, are shown to distinguished visitors, as, for instance, state harnesses, blazing with jewels and gold, gem-studded cimeters and robes, and exquisitely inlaid armor, matchless rugs, chibouks and nargiles, all bedecked with precious stones. But it is well known that these are only a fraction of the contents of the treasury. It must not be forgotten that, with the exception of London, Constantinople is the only European capital which, during a period of nearly five hundred years, has never been occupied and looted by a foreign army. Vienna and Berlin, Madrid and Paris, Lisbon and Moscow, Rome and Athens, have seen the enemy within their walls. But Constantinople, though repeatedly menaced, has never fallen since it was wrested by the Turks from the last of the Greek emperors, in 1453. On that occasion Sultan Mahomet permitted his troops to retain for themselves the spoils which they had obtained from the shops and from the houses of the rich, and most of these things were sold by the soldiers to the Venetian, Genoese and Florentine merchants who flocked to Stamboul for the purpose. But Mahomet kept for himself not only all the marvellous riches found in the imperial palaces, but also the treasures of the Basilica of St. Sophia and of the other sacred edifices, and it is probable that in Sultan Abdul Hamid's treasury to-day are still preserved the crown and sceptre of Emperor Constantine and the very sandals, adorned with gold eagles, which were taken after the siege from the corpse of the last of the Byzantine monarchs. There is but little danger of their having been destroyed, for, prone as we are to speak of the barbarism of the Turks, Constantinople itself furnishes a striking illustration of their absence of vandalism, most notable being, of course, the mosque of St. Sophia, one of the most glorious memorials of the Byzantine era which has been preserved with a care and a reverence for the past surpassing those accorded to many cathedrals and basilicas in Western Europe.

In addition to the contents of the Sultan's treasury, there is what may be described as the personal fortune of each sultan buried with him in his tomb. Every Ottoman ruler at his death has caused his most highly prized belongings to be buried with him, and there has never been any desecration of these tombs, no matter how hard pressed the sultan of the day and his government might be for money. This entombed treasure, thus guarded by the mouldering remains of nearly two-score sultans, is known as the Casuba, and has ever since the days of Peter the Great constituted an irresistible attraction to the emperors of Russia, to their government and to their people. The looting of the Casuba would more than suffice to pay off in its entirety the colossal national debt, foreign as well as domestic, of the Russian Empire. —*Marquise de Fontenoy in New York Tribune.*

COMPARISON OF COST OF CONCRETE AND STONE MASONRY.—The cost of concrete and stone masonry, says *The Scientific American*, varies largely with the local conditions and the character of the work on which they are used; but there are very few places where concrete masonry is not only cheaper than stone masonry, but better, being much stronger and more suitable in many ways. This fact is becoming more generally recognized, and more than one quarry which in former years produced building stone is now producing crushed stone for concrete. The following figures give a general idea of the comparative cost of brick masonry and concrete, per cubic yard:

BRICK.

500 brick	$3.75
¾ barrel cement	1.50
¼ load sand	.50
Labor	2.25
Making a total	$8.00

CONCRETE.

1 barrel Alpha cement	$2.00
¼ load sand	.50
Broken stone	1.50
Labor and forms	1.50
Making a total	5.50

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SOCIETIES, PERSONAL MENTION, ETC.

FOR reasons that we do not profess to understand, the cities of the Low Countries have cherished the mediæval custom of expressing public jubilation through organized public processions in a very notable way, and they have also succeeded in holding the allegiance of their citizens in an unusual degree. This latter characteristic must be due very largely to the fact that the municipality is willing to express a reciprocal interest in the welfare of its citizens individually, while the processional habit is probably due to the surviving influence of the trade guilds. The consequence is that, in place of reserving, as with us, these public manifestations of applause and satisfaction for the deeds of political and military prowess, they are accorded also to those who signalize their strength in the fields of literature, science or art. Thus we find Antwerp proceeding in procession as gleefully because one of her children has won the Prix de Rome as when she welcomes the return from the Congo Free States of a successful administrator. The city of Lille is so near the Belgian frontier that it is not surprising that its local customs, as well as its art and its architecture, should be strongly affected by Flemish influences. It was therefore quite in consonance with local habits that on June 16 M. Cordonnier, to whom was awarded the first prize in the Peace Palace competition, should be conducted triumphantly through streets *"pavoisées"* and filled with applauding crowds to the town-hall, there to be publicly welcomed and thanked by the city-fathers for adding fresh lustre to the city's glory, and then to be entertained as the guest of honor at a public banquet. It is hardly possible to conceive of recognition of peaceful merit being made in this country in just this way and with the same reality of conviction and sentiment. Our city-fathers provide public dinners only that they may have the pleasure of eating them, and the very last excuse for a feast that they could possibly think of would be the paying honor to—the winner of the "Prix de Paris," for instance.

WHILE the occasion in question was delightfully mediæval in flavor, and though the speeches seem amusingly bombastic, they indicate unmistakably that the Lilloise community of to-day believes in art as a living force. But, more than anything else, they confirm us in the belief of the reality of the reciprocal duties that exist, and that should be acknowledged to exist, between artists and the public that is subjected to the influence of their work; and we are more than ever impressed with the substantial magnitude of the duty that is owed to the public by architects, more, perhaps, than by any other class of men that can be named. A community may be influenced by its preachers, writers, editors, its lawyers, sculptors and doctors, but not necessarily; their influence can be avoided. On the other hand, a community *must* be influenced by its architects: what they do cannot be avoided or covered up in a bushel: it must be seen of all men, and its lesson, good, bad or indifferent, must be impressed upon them. If this is so, then architects ought to feel, at least where the public work of the community itself is concerned, under the same sort of moral compulsion that controls the action of physicians and clergymen, who do not feel justified in refusing their services to those in distress simply on the plea that they are "bad pay." It seems to us that an American community would be wise to cultivate after the Belgian fashion the reciprocality that should exist between itself and its architects, and that the latter should be able to perceive that such relations never can be established if the most able amongst them, for one whimsical reason or another, refuse to take part in open competitions for public buildings and, by thus forcing the work into the hands of the less competent, manifest a feeling of indifference as to whether or no the standard of public taste shall be permanently depressed by inferior public buildings. Merely because a few men, who chance to be acting as a political building-committee, are too ignorant or too unwilling to establish ideal terms of competition for public buildings, we hold to be an insufficient ground for the forcing upon the entire public of buildings inferior in character, but essentially permanent in their debasing effect on public taste.

THE substantial propriety of our conclusions in the matter at issue between the New York Tenement-house Commission and the Society of Architects over the issue of permits for tenement-houses planned with so-called "alcove rooms" has been confirmed judicially. Mr. Justice Van Kirk, of the Supreme Court, last week declined to issue a writ requiring the Tenement-house Commission to grant permits in the case of the many building-plans that these officials have held up, on the ground that the alcove-room was incorporated in the plan. Judge Van Kirk now rules that these alcove rooms do violate the law. Instead of wasting time in trying to find some court that will take a different view, Brooklyn architects would do better to unite in bringing about a permanent cure for the greater part of the evils of tenement-house planning, and the cure is a very simple one. What is required is, simply, a law forbidding the erection on a single twenty-five-foot lot of any dwelling-house that is to be occupied

Entered at the Post-Office at New York as second-class matter.

by more than a single family. Such a law would do no injustice to speculative builders, the men who would clamor most loudly against it, since, as a rule, they run up their tenement buildings in rows or blocks of three or more, and it is merely through gross stupidity on their part that they allow the architects they employ—if they employ any—to plan the structures as self-contained twenty-five-foot units.

THE audacity and selfishness of the men who usually undertake, as owners or interested promoters, the erection of the average small theatre is quite beyond comprehension, and their example seems to have an ill effect at times on those who interest themselves in a higher grade of building. Their code seems to be a simple one: any evasion of the law that can escape detection is desirable and adds to the money-earning value of the structure. Those interested in a new theatre of a fairly good class in New York have been in trouble lately with the authorities, who would not issue a final permit for the opening of the building, although such opening had been billed for several dates and the lessees were losing money. As stated in the daily papers, the history of the building, which, to conform at all with the law, has to be a fairly fireproof and well-built structure, appears to be this: It is alleged to be built after plans filed some three years ago, and that in the interval the passageway between it and the adjacent building, which the law fixes at a minimum of seven feet, has in some way shrunk to four feet, and there are certain not very important structural defects which show that the Building Department's inspection has not been as keen and persistent as it always should be in the case of a theatre. The installation of a fire-pump capable of throwing only seventy gallons, when the law calls for one throwing two hundred and fifty gallons, is plausibly explained, and the owners declare they had paid a considerable sum for "fireproofing" the scenery as required by law, and yet a piece of the scenery is said to have burned like an oil-soaked rag in the Fire Commissioner's hand when he touched a lighted match to it!

THE rumor that Chicago's new Post-office building is settling with undesirable unevenness is rather disquieting and not a little disappointing, for, while settlement is the normal fate of Chicago buildings, it was hoped that this building might escape the common lot, not only because great care was taken with the foundations, but because, being a Government building, the loads were applied less rapidly than is the case with private buildings of similar size and weight. Probably the manner in which the strains in the entire under-body of the downtown district are adapting themselves to the burrowings of the freight-subway builders have more to do with the present settling than any vice in the construction of the building itself.

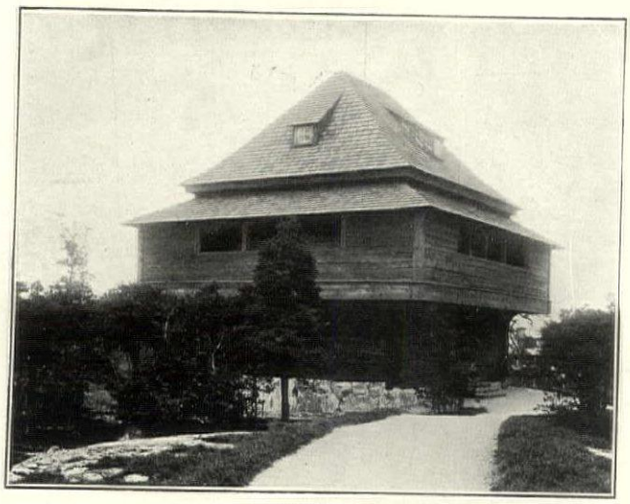
A CURIOUS condition was developed at Buffalo, N. Y., a few weeks ago, one which seems to indicate that it would be well for other cities to examine their ordinances for the sake of discovering whether it is possible for the temporary and accidental absence of a single official to paralyze an important and many-sided industry. We cannot make out just what system in the matter of issuing building-permits is followed in Buffalo, but the fact is alleged to be that something over fifty building-permits were held up by the Aldermanic Committee on Fire, as there was no one who could properly issue the permits in the absence of the Mayor, who was taking a, probably deserved, vacation. Now, while it is of no general interest that a junk-dealer or even a liquor-seller cannot secure a license for two or three weeks, it is a vastly different matter when owners and contractors, confronting a variable market and involved with other contracts, have their large interests needlessly imperilled through some tangle or break in the convolutions of red tape.

THERE are those who would like to have it understood and accepted that the only "real thing" in the architectural line is the *architecte diplomé par le gouvernement*, the French Government, of course. That's as may be. In any case, the architects who have achieved this coveted distinction have, at least, given their proofs, and have successfully passed certain standard tests—tests these that other people have not tried. They are, at any rate, the latest evolutionary product of the profession; they are enthusiastic and convinced believers in themselves and their methods. Now, it would seem that, if competitions were such impiously improper things, the *architecte diplomé* would have nothing to do with them, while, if competitions are permissible, he would know exactly how they should be conducted so as to give universal satisfaction. Now these diploma-owning architects have established a society—a society already provided with a beautiful seal bearing the legend "*la société honore et encourage les hautes études d'architecture*," and this society has been charged with the conduct of a competition for laying out a new city at Guayaquil, in Ecuador. Two things about the programme the society has issued are worthy of note. First, the jury is to consist of eleven men, one representing the promoting company, one an engineer, while of the nine architects five are to be selected by the votes of those who enter designs in the competition. Now, one of the difficulties experienced in the case of the Peace Palace competition was the differences of opinion amongst the jurors; at no time did they approach unanimity, and yet that jury was a smaller one than this one is to be. Next, the programme requires the presentation of only two drawings! Here, then, is just what many architects have been clamoring for: few drawings, and these to be passed on by a jury selected by the competitors. But the millennium has not yet come, for the programme adds that, in addition to these two drawings, competitors may submit "all the drawings that seem worth while, general views, perspectives, details at (any) larger scale, etc." In short, these new leaders of the blind blindly deprive the jury of a common measure which could be used in fairly comparing one design with its fellows. It was just this foolish license that, more than anything else, made the Peace Palace competition so bur-

SWEDEN—I.

IT may be well, for the better understanding of the article and the appended photographs, to insert here the merest outline, a veritable *esquisse-esquisse* of the history of Sweden.

What *happened* before the introduction of Christianity is mostly a blank. Exceedingly rich finds, scientifically arranged and studied, show that there *existed* a high state of culture, even before the time of Christ. Sweden was quite rapidly con-



OLD FATBUREN AT THE MUSEUM OF SKANSEN, STOCKHOLM.

verted to Catholic Christianity, beginning about 800, to a great extent through English missionaries. After two hundred years the new religion was officially accepted by most of the provinces.

Another serious revolution of faith took place under Gustavus

BELFRY, HASJÖ, STOCKHOLM.

I., when Lutheranism was adopted at a diet in the beginning of the sixteenth century. The transition from Mediævalism to Renaissance customs was coincident, a sudden transformation in every way of faith, culture, literature and art.

A third period, with equally sharp contours, begins with Gustavus II. Adolphus, when Sweden enters the Concert of Europe. During the seventeenth century she plays a bold game, becomes a power of the first rank, but lacks the necessary resources to keep on for any length.

This brilliant era came to a sudden end, mostly through the mismanagement of that spectacular combination of warrior-hero and fool-king, the erratic Charles XII. The country was in such a bad way at his death in 1718 that one admires the tenacity that prevented absolute destruction. The following period, the eighteenth century, was one of interior political dissensions, known as the Era of Liberty, when royalty was shorn of nearly all its power.

A sixth period began with the gifted and artistic Gustavus III., toward the close of the eighteenth century. He reestablished the autocracy. In Sweden he represented the Rococo, and endeavored to be a combination of Louis XIV. and Louis XV. Through his son, Gustavus IV., as in the days of Charles XII., the country was brought to the very verge of destruction by the combination of irresponsible power and foolhardiness—only this ruler was a fool in every sense of the word. After a disastrous war with Russia, Sweden lost in 1808 its last foreign possession, Finland, and the king was deposed.

A few years later Charles XIV. John, from France, became king of Sweden, and the new house of Bernadotte entered the royal ranks. This marks the beginning of the last period, and the country has now enjoyed the well-nigh unique experience of nearly one hundred years of peace. It is perfectly safe to say that with its present constitution, and under the enlightened reign of the venerable and many-sided Oscar II., no country is better governed or stands higher in the scale of civilization.

Now a word as to its architecture.

During the Middle Ages, here as elsewhere in Europe, building was confined principally, one might in fact say exclusively, to churches and a few castles. The natural material was timber, but it was soon, very soon, replaced by masonry. Almost nothing remains of the early wood construction, but enough has been discovered to establish that churches were built similar to the interesting and now unique stavechurches of Norway. And the so-called "Svalgang," which is seen there and notably in the timber dwellings, has its exact counterpart in a few houses still

BELFREY FROM HELLESTOD, NOW AT THE MUSEUM OF SKANSEN, STOCKHOLM.

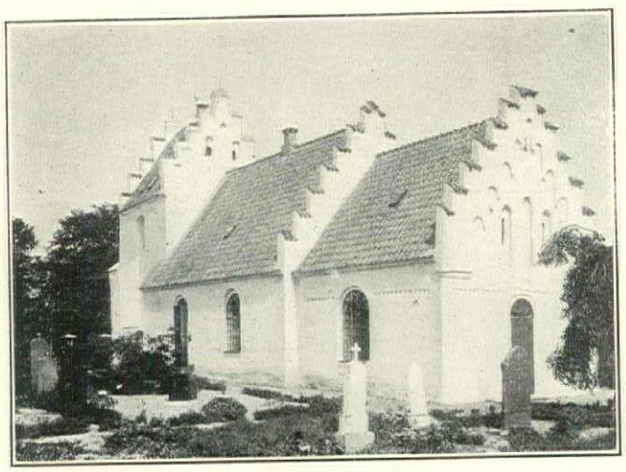
standing in Oerebro and at some other places. Even the characteristic "Stabur," with its overhanging second-story, has in "Fatburen" from Skansen a close relative, but without the elegance of the Norwegian work.

In the free-standing campaniles, however, Sweden has a distinctive construction. These are to be seen specially in the middle and northern portions, and often alongside of churches which

themselves have towers. It is therefore evident that if the towers were not later additions, as was quite often the case, they were from the beginning intended not for belfries, but for defense. It is curious to see how the churches themselves, and in some

DWELLING FROM BOLLNAS, NOW AT MUSEUM OF SKANSEN, STOCKHOLM.

instances the walls and the gates of the surrounding cemetery, were built for military as well as religious purposes, where crenellations, parapets, blind stairways, loopholes, and other earmarks



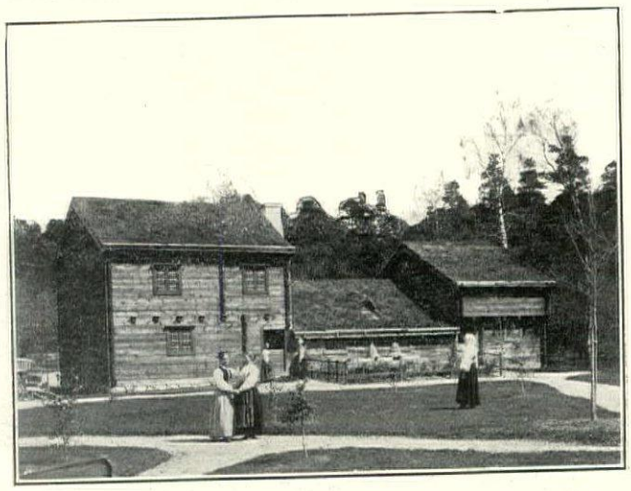
DALKOPING CHURCH, SO. SWEDEN.

of a turbulent period remain. A few illustrations are given of these wooden belfry towers, most of which are of Renaissance date but have, no doubt, derived some characteristics from older

HORBY CHURCH, SO. SWEDEN.

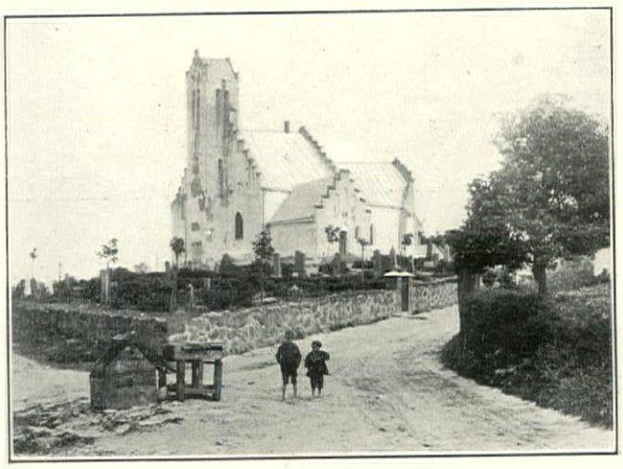
existing models. They are a picturesque element in the landscape, with their dark mass set off sharply against simple outlines of the church, the almost invariably whitewashed. It is the "hat," the roof, which has received the most attention, and almost always has curved outlines.

Of other timber construction there is little to say. Practically nothing remains of old dwellings, and the artistic traditions which



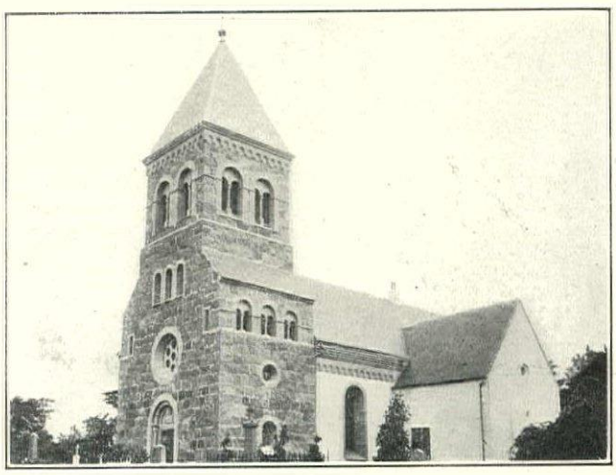
A RYGGASSTUGA, AT THE MUSEUM AT SKANSEN, STOCKHOLM.

were in Norway transferred from the ecclesiastic to the domestic sphere, and there preserved by the very people, were here lost, except in the province of Sloyd, including weaving and the many



FRU ALSTADT CHURCH, SO. SWEDEN.

and distinctive national costumes. A few views of dwellings are included, rather haphazard, but enough to show that there was a type quite marked and very different from the Norwegian.



BJERSGO CHURCH, SO. SWEDEN.

But the feverish building activity of the Middle Ages soon dotted the country with masonry churches. These are, in middle Sweden, mostly built of a granite-like stone, abounding in all

parts, and nearly always stuccoed and whitewashed, both within and without. Though not always originally vaulted, by far the greater number are now so covered. Few buttresses are to be seen, but the walls are exceedingly heavy, being often four feet thick in a small country church. The architectural influence of these middle-country churches traces back mostly to England through the English missionaries. The carved ornamentation is reduced to a minimum, owing partly to the limited resources and lack of workmen, but also to the rigors of a climate which finer workmanship could not long withstand. It is also quite possible that a certain sombreness of the national character opposed an exuberant expression, this all the more as the vagaries of the Flamboyant style are nowhere to be seen, and that at a still later period this natural sobriety had much to do with preventing almost entirely the meaningless excrescences of the Baroque. Indeed, the richer Gothic was never so thoroughly at home as the plainer Romanesque, and even to-day Sweden has withstood the onslaught of l'Art Nouveau with greater success than most other countries.

In Southern Sweden the building material was more often brick, as there the architectural influence came from Germany and the Lowlands. The towers are mostly treated with crow-stepped gables, giving them a quaint, somewhat domesticated air. Free-standing belfries are unknown. A peculiar surface-decoration was often adopted, consisting of a pattern of sunk panels, the lower field plastered white. This was also practised in other parts of the country where brick was used, and makes an effective surface as seen in the cathedrals of Strängnäs and Vesteras. The architects of to-day have adopted the idea with marked success. They call this "Baltic." A previous article has shown[1] the modern treatment, and also how the present-day architects make use of another old-time suggestion—the suppression of the clerestory in the aisled church and its revival as a mere decorative feature, a welcome break in the large roof. This gradual elimination of the clerestory has, it seems, never been mentioned, and yet the successive steps can easily be seen, though the list that is here given is not one of chronological sequence.

OLOF Z. CERVIN.

(*To be continued.*)

SPONTANEOUS IGNITION OF WOODWORK.[1]

NEXT to matches as a cause of accidental fire comes the firing of woodwork by faults in flues or overheating in the vicinity of the fireplace. One would imagine that such a thing as building a beam into a chimney, or laying a joist close under the hearth of a fire-grate, would be so manifest a danger as to insure its never occurring, but such criminal carelessness is by no means so uncommon as one might imagine, and in such cases it is only a question of time and chance for a fire to be caused by it.

A beam, the end of which impinges on the interior of a flue, may be so far above the grate that for years no trouble arises, but the hot upcurrent of gases in the chimney will gradually dry and carbonize the wood, whilst any collection of soot in the chimney catching fire will start a smoldering combustion in the beam that may go on for a considerable time before it gets sufficient air to cause it to break into active combustion.

A more usual source of danger is to be found in the perishing of the mortar used in building the flue, this leaving gaps in the brickwork behind which the woodwork is situated. Mortar practically consists of a mixture of slaked lime and sharp sand, and when brickwork has been laid with this, the first hardening of the mortar is dependent upon the slaked lime absorbing carbon dioxide from the air, which converts it into carbonate and causes it to harden, while after the lapse of many years a further action takes place by the silica of the sand acting on the calcium carbonate to form a silicate of great hardness and strength. With modern buildings, however, the first action is the only one that has taken place.

The brickwork in the interior of a flue is often very roughly laid, being out of sight, and the bricks, instead of being laid true and nearly touching, are made up with broken bricks and a considerable quantity of mortar. After this has set the action of heat upon it is again to burn the calcium carbonate back to lime, so causing the crumbling down of the mortar, and should a joist have been built-in close to the casing of the flue, hot gases will find their way through the perished mortar to it, and gradually bring about slight carbonization of the wood, and occasionally cause its ignition.

Another fruitful source of danger is to be found in the replacement of one form of grate or fireplace with a new one. For instance, a grate is getting rather old, and you determine to have it replaced by one of modern construction, say one of the "well fires." In the old grate the hearthstone was flush with the floor, and under this was a sufficient mass of concrete or mortar amply to protect the joists below from undue heat. You probably buy a new grate from a local ironmonger and intrust him with the job of fixing it, and the old hearthstone and insulating material having been removed to make way for the entirely different structure, the inexperienced workman fails properly to insulate the bottom of the well-grate, with the result that the joists below get overheated.

Dangers of these characters can only be got over by strict supervision during the building of a house, and by intrusting alterations and repairs only to workmen who thoroughly understand the work which has to be done.

All heating dangers are largely increased, and indeed chiefly exist from the fact that lightly-charred wood becomes almost pyrophoric in its character, and can readily be set on fire at temperatures considerably below those needed to start the combustion of either uncharred wood or charcoal. The changes taking place in wood under the influence of long-continued heating are of a complex and interesting character.

Wood consists mainly of a definite chemical compound called cellulose, a body formed from carbon, hydrogen, and oxygen, and besides cellulose we find wood contains the constituents of the sap and a varying quantity of water. The amount of water present depends upon the season of the year and the portion of the tree from which it is taken, while the percentage is, as a rule, greater in soft than in hard woods, the following table giving an idea of the quantity present in various kinds of wood:

Beech	18.6	per cent.
Oak	34.7	"
Common Fir	32.7	"
Alder	41.6	"
Elm	44.5	"
Poplar	50.6	"

When wood is placed under cover and exposed to the air for about a year the moisture is reduced to about 20 per cent., and the remaining moisture can be got rid of by subjecting the wood to the action of heat, the last portions requiring a temperature sufficient to char the wood. If, however, the wood be heated somewhat below this point the greater part of the moisture is removed, but on again allowing the wood to cool to atmospheric temperatures and exposing it to the air, the hygroscopic nature of the wood gradually attracts moisture until the percentage reaches about 20, at which point a sort of equilibrium is established between the moisture in the air and the wood.

When wood is exposed to the long continued action of heat it undergoes progressive changes nearly akin to those which have taken place during the conversion of vegetation into coal. Up to 100°C. (212°F.) practically only moisture is expelled from the wood, and at a few degrees above this point not only water but volatile hydrocarbons are slowly driven out, while at 150°C. (302°F.) oxides of carbon, together with more hydrocarbons, are disengaged, and slightly above this temperature the wood commences to assume a scorched appearance, and to turn brown. At about 250°C. (482°F.) wood is converted into a soft brownish form of charcoal, which is its most dangerous form, being highly pyrophoric and self-igniting at comparatively low temperatures. At 300°C. (572°F.) the carbon begins to assume the appearance of soft black charcoal, getting harder and more metallic in its properties as the temperature increases.

The chemical changes which are taking place in the charcoal at these varying temperatures are strictly shown by the following table:

Temperature.	Carbon.	Hydrogen.	Oxygen.	Ash.
270°C.	71.0	4.60	23.00	1.40
363°C.	80.1	3.71	14.55	1.64
476°C.	85.8	3.13	9.47	1.60
519°C.	86.2	3.11	9.11	1.58

It is seen that as soon as 270°C. is reached the action consists in a gradual increase in the percentage of carbon, owing to the elimination of hydrogen and oxygen, and it is clearly due, therefore, to compounds still containing these three elements in comparatively large proportions that the pyrophoric carbon owes its dangerous character. If the contact of the wood with the heated

[1] Extract from a lecture by Vivian B. Lewis, Professor Royal Naval College, Greenwich, published in the "Journal" of the Society of Arts.

surface be continued for a sufficiently long period of time, a temperature of a few degrees only above the boiling-point of water is enough to produce a semi-carbonized film on the wood, which will start smouldering at a very low temperature, the heat rising from an oil lamp or gas flame some distance away being sufficient to start the smouldering combustion. Indeed, the temperature of a steam-pipe has been found sufficient to cause ignition, this being due probably to the long-continued heat generating certain hydrocarbons of low ignition point, which remain occluded in the pores of the semi-charred wood, and are there brought into close contact with the occluded oxygen.

It must be remembered that, when using steam heating, although the boiling-point of water at ordinary atmospheric pressure is only 100°C. (212°F.), yet the boiling point rapidly increases with increase of pressure, as is shown by the following table:

Pressure in atmospheres.	Boiling-point. ° C.	Pressure in atmospheres.	Boiling-point. ° C.
1	100	12	190.0
1.5	112.2	14	197.2
2	121.4	16	203.6
3	135.1	18	209.4
4	145.4	20	214.7
5	153.1	25	226.3
6	160.2	30	236.2
7	166.5	35	244.8
8	172.1	40	252.5
10	181.6	45	265.9

So that in lofty buildings heated either by water or steam it is quite possible to obtain temperatures which will dangerously char wood in contact with the pipes, while with air as the heating medium it is by no means uncommon to find a dull red heat in the pipes and flues near the furnace. Nor does the danger cease when care is taken that the pipes or flues used for these methods of heating are kept several inches away from any woodwork, as in inaccessible places the accumulation of dust on the pipes often gives rise to trouble.

When a hot-water or steam pipe is laid alongside a wall, it will be noticed that where a flange or other projection of a pipe touches the wall there is a brown stain produced on the wall surface streaming upwards from the point of contact and becoming less the farther away it gets from the place where it starts. Experiment shows that this is due to dust settled on the pipe becoming carbonized and ascending with the hot-air current produced by the pipe; this current comes in contact with the surface of the wall and, the hot gases rapidly diffusing through, the charred particles are filtered off, remain on the surface of the wall, and give the stain. When, however, the accumulation of dust is large, the carbonized mass being in a very loose state of aggregation and made up of very minute particles, will often start glowing with a very slight increase of temperature above the ordinary temperature of the pipe.

The fire-risks due to lighting are of a most varied character, even daylight itself not being free from danger, hundreds of fires having been caused by the accidental focusing of the sun's rays by means of a full water-bottle, irregularities in the window pane or other cause, which has led to the concentration of the sun's rays upon some inflammable substance.

FREDERIC DIAPER.

IN a letter to the New York *Tribune*, Mr. A. J. Bloor writes as follows of the late Frederic Diaper: "He was, as you say, formerly 'one of New York's leading architects,' and continued to hold that rank up to a much later period than you indicate. As a pupil of his, I should like to be permitted to offer a slight tribute to the memory of a man, the recollection of whose sturdy devotion to the professional ideal contributed not a little to inspire and to sustain, under constant inappreciation and frequent misapprehension and discouragement, my own efforts toward working up, from the chaotic condition of the profession as late as the 70's of the last century, that profession's official representative body, the American Institute of Architects—of which Mr. Diaper was one of the founders—and its New York branch, to that ideal, during the many years of my trusteeship and secretaryship in those organizations.

"My thoroughly-equipped preceptor was for many years *facile princeps* in the higher region of the domestic field of architecture, as Upjohn the elder was in its ecclesiastical output. Born in Devonshire, England (I think he told my father, not Hampshire), he was, after receiving a liberal education on general lines, 'articled' to Sir Robert Smirke, in London, for a term of years, according to the thorough English system of professional education, which, by the way, then included—and perhaps still does—the payment of a considerable premium to the practitioner selected as the medium for instructional opportunities. Sir Robert was an eminent practitioner of his day, and the architect, among other stately structures, of Sir Robert Peel's notable seat of Drayton Manor. The good use young Diaper had made of his tuition was so apparent when he became his own master that he was elected a professional member of the Royal Institute of British Architects and began to practice on his 'native health.' But, being ambitious and energetic, he soon sought quicker opportunities in the New World, and his connection with the British society being changed to corresponding—in conjunction, if I remember rightly, with honorary—membership, his enterprise was rewarded by quick recognition and prolonged patronage on the part of the 'merchant princes' and financiers then uppermost in New York, who speedily appreciated not only his professional, but his social availabilities.

"Nearly all of his buildings in and around Wall Street and Broadway have been demolished to make room for 'skyscrapers' of greater or less altitude, and the same has been the case with the residences (known as 'palatial' in that 'day of small things' and as yet un-Europeanized denizens) erected by him on so many of the blocks in Fifth Avenue and adjacent streets—some of them, by the way, far below Twenty-fifth Street, to which your dispatch limits him southward. Among the Wall Street structures were the Bank of America, the Union Bank, the City Bank, the Seaman's Bank for Savings, the Phenix Bank and the wide structure next it in William Street, directly opposite the Merchants' Exchange, at that time, now the Custom House, with its fortunately still-preserved superb array of immense monolithic columns. It was the first, I think, of the buildings specially devoted to and named after an insurance company, though my memory is hazy as to the name in this instance. He built also a savings bank in Chambers Street, opposite the City Hall Park. Near the foot of Broadway stood his Delmonico's Hotel, afterward the Stevens House. Higher up on the same main artery I recall, among other works of his, the Society Library Building and the New York Hotel. Farther uptown stood, until a year or two ago, his double house for William H. Aspinwall, at the northeast corner of University Place and Tenth Street. It was notable for several novelties (for the time of erection) in interior construction, *e. g.*, a large window immediately above the mantelpiece of a fireplace; and its exterior presented to view a long picture-gallery, the first private one thus in evidence in New York, I think, unless one attached to the Broadway side of a house at Bond Street, built (not by my preceptor) for Mr. Ward, the father of Julia Ward Howe, was an earlier instance. Mr. Aspinwall's house, like so many of Diaper's design, was supplemented by a smaller one, on the same external lines, built for Mr. Colles.

"In Fifth Avenue I remember, among the many houses he built, Mr. Minturn's, at Twelfth Street, and next it Mr. Talbot's, both double ones and both still standing when I was in New York last May. On the same thoroughfare, near Fourteenth Street, and also on the west side, he put up houses for August Belmont and Mr. Lamar, and just around the corner, on Fourteenth Street, one for a Philadelphian, Mr. Jones; one, too, on the southeast corner of Sixteenth Street, for Daniel Parish, and, later, for another member of the Parish family, one on the northeast corner of Nineteenth Street, still, or very lately, extant. Directly opposite this were two of his houses, for John Paine and a son of the latter's, also still standing, but the original façade altered, for business uses, beyond recognition. A block farther down, on the northeast corner of Eighteenth Street, he built a double house for Mr. Gihon (August Belmont bought and lived in it for many years), with a single house next it in the avenue, having façade lines in unison with the larger house.

"Returning still farther southward to Union Square we find not one façade left of some half-dozen or more he put up on its south, west and north sides when the tide of residential fashion overtook it. Of the owners' names I recall only those of Mr. Miller, father-in-law of Jay Gould, and two on the south side, one next that on the west corner of Broadway, long occupied, before its destruction, by one of the Roosevelt family and built for Mr. Phalon, next to which was a double one for Mr. Penniman, both of whom afterward joined the American colony in Paris.

"I recall no more of Diaper's work between Seventeenth and Twenty-third Streets, but above that there were several examples, all of which, however, have, I think, been replaced by skyscrapers,

whether for domiciliary or commercial use, till one finds still—or did within a few months—standing on the northeast corner of Thirty-seventh Street, directly opposite Tiffany's new palace, a double house, built for Murray Hoffman, but afterward long the residence of Governer E. D. Morgan. This, like the Gihon-Belmont house, is duplicated, as to façade features, by an attached single house in the avenue; and this was for a number of years the residence of Mr. Diaper himself, with his family.

"Apart from important public buildings small opportunity was in those days afforded the architect in America to deliver his whole artistic message; but as far as he found his chance in domestic work my preceptor showed a full appreciation and skillful handling of the Italian Renaisasnce in its purity, and nearly all of the examples above enumerated emphasized the characteristics of that school with precision and dignity, without the slightest penchant toward the latter-day flamboyancy of its French variety. His designs for exterior work were free alike from pedantic overlaying and from baldness, while his planning was wonderfully apt and complete, and his construction uniformly of the most thorough, stable and enduring character.

"His output was mainly in urban architecture, but he built not a few country houses, with their appurtenances, including, among the more important, a castellated marble residence for Mr. Aspinwall and an extensive villa for Mr. Pickersgill, both on Staten Island. From him, too, came the design for a mansion for Patroon Van Rensselaer at Albany, and one near Fishkill for Gulian C. Verplanck. The former was as strictly Classic as compatible with domestic uses. In the latter he allowed himself somewhat more latitude in façadal expression than was usual with him in town work. He permitted himself still more—as was natural and, indeed, almost inevitable—in the case of more ordinary residences built for summer occupation. As with most other distinguished and much employed architects, Mr. Diaper also contributed his share of design to American architecture in more distant localities than his vicinage, but his style and methods continued much the same, so far as conformable with local exigencies.

"It is only a very few years since my preceptor was still engaged in quiet practice among the children and grandchildren of his old friends and patrons, quite to the satisfaction alike of his clients and himself; and his prolonged usefulness and remarkable longevity—leaving us, as you indicate, when only four years off from the century mark—afford another to the many examples of the fact that professional (particularly artistic and literary) labor pursued, not with money-grabbing furore but in an appreciative and faithful spirit, even with, as not infrequently, more or less self-sacrifice, is not of the sort in which the candle is burned at both ends.

"His death leaves Leopold Eidlitz the dean, one may say, of the profession in New York, and perhaps in the whole country. Eidlitz's contributions to American architecture have been on the lines of quite another school of the art—and still more of very different intuitions and inspirations—than those of Diaper; but the broad minded and candid Classicist or Renaissanceist will hardly deny him at least an equal eminence with—and certainly more originality and boldness than—my distinguished preceptor. Both, though foreign-born, have largely, and, perhaps about equally, contributed to the advancement and honor of the architecture of their adopted country, and, however quickly the examples of their brain work may disappear, the traditions and salutary influence of their faithfulness to an artistic ideal will, it is safe to say, outlast such aberrations in current pro forma design as occasionally occur in architecture, as in all other fields of the fine arts."

WHAT IS A MARBLE ALTAR?

THE decision of the Board of United States General Appraisers, in the matter of a carved marble altar imported by a certain Mr. E. Battelli for presentation to the Church of the Immaculate Conception at Newburyport, Mass., does not appeal to one's general sense of justice, and is not clearly sound as technical law. The altar was brought in through Boston, and the Collector of Customs at that port assessed a duty on it of 50 per cent. of its value. Mr. Battelli appealed from this assessment, and thus the matter came before the Board of General Appraisers. This board decided that the altar would be exempt from duty as a work of art if Mr. Battelli, beforehand, had done two things, namely, made a written declaration of the purpose of the importation and presented a letter of acceptance from the religious corporation for which the altar was intended. Not having done these two things at the time the altar appeared before the Boston Collector, the board decided that Mr. Battelli must pay one-half of the original cost of the altar in order to get it to the religious edifice in which he is trying to place it as a personal gift. The board also decided that "the regulations imposed by the Secretary of the Treasury have the effect of law," thereby meaning that the requirement in regard to the declaration of purpose and the letter of acceptance is merely a Treasury regulation and not a provision of law made by Congress.

The fact is that carved marble altars to be given to churches were not provided for by the framers of the tariff law, and all these proceedings in the case of Mr. Battelli are merely attempts to whip the devil around an imaginary stump. Mr. Battelli himself is not an importer in this case, within the meaning of the law; a carved marble altar to be given away is not "manufactures of marble not specially provided for in this act, 50 per cent. ad valorem." This being the clause under which the Boston Collector worked out his rule of paying one-half the cost; and there is not a word in Sections 758 and 759, concerning works of art, that can be applied to a marble altar given to a church, unless the words "for the purpose of erecting a public monument" could be so construed—a construction that is entirely forbidden by a succeeeding clause which runs, "nor [imported] for any other purpose than herein expressed." Actually, the sole exact thing in this entire bureaucratic proceeding is the statement of the Appraisers that a Treasury regulation has the force of law, at any rate in regard to works of art, the law prescribing in both sections that the Secretary of the Treasury has power to make rules or regulations for applying these sections.

It seems to us that if the Boston Collector had had two grains of everyday sense in his composition, and had honestly been in doubt as to his duty, he would have sent a note to the Secretary of the Treasury, asking what he should do with this abnormal and unspecified carved marble altar for a church. It will come to this in the end, of course, for no one outside our Government bureaus imagines that this country is going to make the giver of a foreign-made altar to an American church pay one-half its original cost for the legal right to do so. Instead of acting upon his own common sense, or asking for superior guidance, the Boston Collector thumbed the pages of his little book until he reached "marble," hastily ran over "block, rough or squared," "veined marble, sawed, dressed, or otherwise," saw that none of these specifications would fit a church altar, and then let his eye fall upon "manufactures of marble not specially provided for," brightened up as he saw this plain path of duty before him, and straightway said, in his most impressive official manner, to the man who was trying to give an altar to a church in this country: "Fifty per centum of the value, please." The fact that the marble altar was not a manufactured article within the intention of the tariff law—that it was not brought to this country for any other purpose whatever except to give it as a free gift to those for whom it was designed—did not shake the Collector's confidence that, if he could not find carved marble altars as free gifts in his little list, he could at any rate find some clause that would answer as well for all official purposes. He did find it; and the Board of General Appraisers has met and gravely pondered over his discovery, and practically supported it; and, after all this official fuss and red tape, the purely artificial question will be sent, duly certificated and with more red tape, to the Secretary of the Treasury, and he will simply answer: "What! A carved marble altar to be placed in one of our church buildings as a free gift? Why, of course, that comes in free.

The men who administer our useful tariff law ought not to imagine that they have the right to stretch it over free gifts. Those who made the law stretched it over everything that is commercially possible, and that is enough. This country is merely made ridiculous when one of its agents sets up, and very nearly out of his own head, a port tax on altars given to our churches.—*Hartford Courant.*

COMMUNICATIONS

"SEVEN COUNTS IN ASSUMPSIT."

BALTIMORE, Sept. 13, 1906.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs:—Our attention has been called to an article appearing in your paper of September 1, page 66, in reference to a suit which we are bringing against the National Bank of Commerce and Commercial Realty Corporation, of Norfolk, Virginia.

We are rather surprised that you should publish excerpts from the pleadings instituted by our counsel and omit the final one. The form of pleading is the one known in common law as "Seven Counts in Assumpsit," and is a well recognized form in the State of Virginia and elsewhere.

Our claim is not for goods bargained and sold, money lent, etc., etc., but for services rendered, in accordance with the practice of the American Institute of Architects. If you would take the trouble to discuss these "Seven Counts in Assumpsit" with your attorney, you will find that the article appearing in your paper is ill advised.

Yours truly,
PARKER & THOMAS.

[IT seems to us that the opening sentence of the paragraph our correspondent refers to sufficiently avows a layman's ignorance Even with the knowledge now afforded that the antiquated form of pleading in "Seven counts in assumpsit" persists in Virginia, we find the language of the declaration no less curious and amusing than before. As for the final plea, it is merely narrative and was sufficiently covered by our statement that the architects were suing to recover "some six thousand dollars' balance unpaid." However, as no other reason than want of space prevented our giving the language of all the pleadings in full, and as space in this part of the paper is more elastic than in our editorial columns proper, we will add that the final plea reads thus: "7. That the defendants employed the plaintiffs on or about February 23, 1904, as architects for the building at Main and Atlantic streets; that the plaintiffs acted as architects for the building and made all plans and specifications for the same, and that the defendants refused to pay the plaintiffs a balance of $5,695.92, still due, although payment has been demanded."—EDS. AM. ARCHITECT.]

ILLUSTRATIONS

SINGER-BUILDING ADDITION, BROADWAY AND LIBERTY STREET, NEW YORK, N. Y. MR. ERNEST FLAGG, ARCHITECT, NEW YORK, N. Y.

PLANS OF THE SAME.

UPPER PART OF TOWER OF THE SAME.

DESIGN FOR A COTTAGE. MESSRS. BOSSANGE & NEWTON, ARCHITECTS, NEW YORK, N. Y.

FARM BUILDINGS, DARIEN, CONN. MESSRS. BOSSANGE & NEWTON, ARCHITECTS, NEW YORK, N. Y.

FARM BUILDINGS, KATONAH, N. Y. MESSRS. BOSSANGE & NEWTON, ARCHITECTS, NEW YORK, N. Y.

STONE ALTAR AND REREDOS; TRINITY CHURCH, GENEVA, N. Y. MR. GEORGE T. PEARSON, ARCHITECT, PHILADELPHIA, PA.

Additional Illustrations in the International Edition.

Owing to a blunder in the bindery the following plates, although properly dated, were made up and published with our issue for last week. It has been necessary, of course, to reprint the plates that they may accompany this issue, and this will account for the serving of a double ration of the same subjects.

MONUMENT TO JOAN OF ARC, ROUEN, FRANCE. M. E. L. BARRIAS, SCULPTOR.

MONUMENT TO THE DEFENSE OF DIJON, DIJON, FRANCE.

MONUMENT TO THE REPUBLIC, PARIS, FRANCE. M. CHARLES MORICE, ARCHITECT; M. L. MORICE, SCULPTOR.

MONUMENT TO GAMBETTA, PLACE DU CARROUSEL, PARIS, FRANCE. M. C. L. BOILEAU, ARCHITECT; M. J. P. AUBÉ, SCULPTOR.

NOTES AND CLIPPINGS

"COYOTE HOLES."—A Seattle newspaper man tells in the *Post-Intelligencer* the results of a recent investigation of odd-named occupations advertised in that city. He found very soon that the name of an occupation was in many cases a very poor indication of its character. His advice was therefore that a young man seeking employment had better make very sure that the work he was engaging to undertake bore some suggestion of its name, or else he might find himself under contract to accomplish something that was very unlike that for which his talents or training fitted him. For instance, the searcher for a job would discover that "boring drills for coyote holes" is altogether misleading in what it suggests. It is not, as might be supposed, carving out residences for these wandering minstrels of the prairies on the ranch of some eccentric but philanthropic farmer. Drilling coyote holes is the name applied by railroad contractors to drilling blast holes in grade running cuts through hills. The fact that the holes are T-shaped, similar in outline to the coyotes' dugout, accounts for the name.

A DESERTED VILLAGE.—Hidden behind the precipitous, rocky bluffs of Point Mamainse, on the north shore of Lake Superior, lies the abandoned $1,000,000 village of Mamainse, with 50 houses besides other buildings, all of which are constructed of fine white pine. This deserted village is a monument to the folly of a rich English corporation, which was hunting for a copper mine, and, misled by outcroppings, built the village before sinking shafts.—*Exchange.*

SECURING A STAGE VIEW IN PARIS THEATRES.—Some necessary reforms in Paris theatres seem to be heralded by the action of M. Antoine, at the old Odéon. His fiery energy, says the *Telegraph*, has had the ancient playhouse transformed from top to bottom. The worm-eaten stalls, the draughty yet narrow passages, the crooked boxes, are now no more. The theatre has been completely regenerated. The new director walked all over the house, and sat in every seat, one after the other. Whenever he ascertained that from any place the stage was not sufficiently visible, he actually ordered the place in question to be abolished. This is sheer revolution. Hitherto Paris playhouses had been divided into a certain number of seats, as many as possible, irrespectively of the spectator's or would-be spectator's convenience. If you bought a seat from which you could just see the heroine's feet when she was in the left corner up by the footlights, it was "*tant pis*" for you. You ought to have known better than to buy such a seat. But M. Antoine has succeeded, though with difficulty, in "changing all this." The Government Department of Fine Arts figuratively threw up its arms in horror when he proposed reducing the number of salable seats in boxes from four to three, merely because from the fourth seat it is impossible to see the stage. In Paris, as everyone knows, no Parisian, asked by a lady to join her in her box, ever does expect to see the stage. It is not etiquette to desire anything of the kind. However, M. Antoine has actually overridden etiquette, and succeeded in abolishing the platonic seat from the boxes in question.—*British Architect.*

MIXING COLORS.—In the *Painters' Magazine*, of New York, a series of articles have been running under the head of "Talks with a Veteran Painter." We extract the following chat:

"I had one amusing case of an architect who wanted to mix his own color, so as to be sure he would get exactly what he wanted. I thought I would let him try, and teach him a lesson. So I sent a man to meet the architect at the building, and plenty of tinting color, umber, ochre, sienna, and black, with all the white lead that was wanted, and I gave him instructions to do exactly as the architect told him, and not to volunteer any suggestions whatever. Well, along toward noon I went there myself, and found the architect still there. They had used up fifty pounds of lead and a lot of tinting colors, and so far they hadn't got anywhere. Well, I knew pretty well what he wanted, but he didn't know how to get it. I saw that he was getting pretty tired, so I suggested that perhaps I might be able to get the color he wanted, and he was very willing by that time to let me try. So I mixed together some burnt umber and burnt sienna, and toned it up with a little ochre for the body color. I didn't use any white lead at all. For the trimming color I used more of the umber and got a deeper shade. It didn't take me five minutes, and when he saw it on a board he said it was exactly what he wanted. He had been half a day at it, but couldn't get it."

ROMAN FINDS AT MONT AUXOIS, FRANCE.——The Archæological Society of Semur, in Burgundy, recently decided to excavate the site at Mont Auxois, on the Paris and Marseilles Railway, between Paris and Dijon, of the Gallic town of Alesia, where Vercingetorix made his last stand against Julius Cæsar. Already the results have more than fulfilled expectations. A theatre has been unearthed, and an immense forum of the Augustan period, some 40 or 50 mètres long. Many traces of other monuments have also been brought to light. Major Esperandieu, the director of the excavations, made a statement on Tuesday before the Academy of Inscriptions and Belles Lettres, confirming the view that Alesia has always been a religious centre and a market. The Romans did not insist on its evacuation after the Conquest as they did in the case of the *oppida* of Bibracte, near Autun, and of Gergovie, near Clermont-Ferrand. Statues, bas-reliefs, and many varied objects are daily being brought to light by the pick.—*Building News.*

The American Architect and Building News.

Vol. XC. SATURDAY, SEPTEMBER 29, 1906. No. 1605.

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SOCIETIES, PERSONAL MENTION, ETC.

A FEW weeks ago we expressed the belief that the appointment of Mr. Raymond F. Almirall as architect of the new Public Library for Brooklyn, N. Y., could hardly fail to draw out a protest, not on the ground that an unfit selection had been made, but because there had not been a public competition. The protest has made its appearance in due course, but it does not proceed, overtly at least, from any architect or society of architects, and this under the circumstances is sufficiently surprising. It is the Trustees of the Public Library who protest, gentlemen who possibly know as much about architecture and architects, and who surely must be conceded to know more about library needs than Mr. Coler, the Borough President, who arrogated to himself the right to deal with a great public need, involved in which will be the expenditure of two or three millions of the public money, quite as if he were about to build a private building and pay for it out of his own pocket. While direct selection of an architect is entirely right and desirable in private and much corporate work, we are very far from being convinced that it is the best, or even a proper, way to deal with public buildings. The Brooklyn Public Library Trustees evidently share our opinion, for they have voted "that this Board regrets the action of the President of the Borough of Brooklyn in designating an architect for the Central Library Building previous to the completion of the study of the site provided for by the appropriation of $25,000 and the preparation of preliminary suggestion or a basis of competition for architects generally, and that it favors such public announcement as would enable other architects of the borough and of the city and from the country at large to present plans or enter into competition, so that the best possible plans may be secured."

IF the American Institute of Architects were purely, or mainly, a beneficent organization, bending its efforts toward the elevation of the art and the amelioration of the methods of those who practise it, instead of being chiefly concerned with the material welfare of its members—if, that is, it were what it should be and less the trade union that many of its members are nowadays trying to force it to become—it would not only undertake to do something effective to assure to the public that it should always and everywhere have the benefit of the best architectural service procurable, but would actually and, we believe, easily do it. It is unquestionable that a community builds its public buildings for the common use of that community, and, as they are paid for by money drawn, theoretically, from the pockets of each citizen, it is obvious that in common fairness and decency these buildings should satisfy the needs, hopes and requirements of every one. Although standards of judgment vary, there is one which can be used every time and everywhere: every individual will agree that theoretically the public, spending public money for public buildings, deserves to get in return "the best," not the best merely as understood in that community, but the abstract best, so far as it is humanly procurable. This right that a community has to receive the best for its money is as real in the case of a small town as of a large one, and the procedure to adopt in securing it in one case should be the procedure to employ in the next one, in every one. In other words, what is desirable is a common and non-evadable practice established by municipal enactment or State law—but the same all over the country—by which each community may secure for itself the best public buildings procurable with the public money, a "best" measured not by a local and temporary but by an abstract and permanent standard. This matter, which has always been of importance, is now of greater interest than ever, seeing that we are coming within reach of indestructible building methods, and public buildings are likely to exert their good or baneful effect on public taste through a longer span of life than formerly. We feel quite sure that the American Institute of Architects could devote its energies to no more useful end than the attempt to introduce the uniform system of dealing with the designing of public buildings of which there is such obvious need.

IF public officials, to whom the direct selection of architects or the conduct of competitions is now generally entrusted, were all-wise, well intentioned, scrupulously honest and fairminded, architects who respect and value the art they practise might not feel called on to take action as a body, arguing that each community would be fairly likely at the hands of its selected servants to secure a public building which that particular community would be justified in accepting as the best it could obtain and a fair equivalent for its money. But every one knows that in too many cases our public officials are far from being all-wise and only too often are something other than honest and well intentioned. To our mind, there is no method so likely to secure to a community the most satisfactory design for a public building at that time procurable as the compound competition which adjoins the certainty of being able to fall back on the designs furnished by the

Entered at the Post-Office at New York as second-class matter.

specially invited and paid "leaders of the profession," to the possibility that "new talent" of value may be developed in the first part of the competition, the open one. If architects knew that all public buildings were to be secured in this way, always on proved merit and not through wire-pulling and chicanery, there would very quickly be a falling off in the number of designs presented by the incapable; further, the system having a recognized standing and universal acceptance, would eventually tend to increase the serious character of these tourneys and bring forth work of higher and higher worth. If, perchance, the adoption of a general compulsory competitive system should be opposed on the ground that it would increase the aggregate waste of time and labor on the part of defeated contestants, it should be remembered that a private citizen can squander his time and effort with no better grace than when he expends them in behalf of the community at large.

COMMENTING on our argument that the Supervising Architect of the Treasury Department, as represented in the person of the present incumbent, receives a salary utterly incommensurate in its meagreness with the value of the service he renders to the Government, the *Builders' Journal* points out how much better off are the architects who hold similar positions in England, though we fancy that the scale of their operations can hardly be as great as that of our own less fortunate official. It appears that the Supervising Architect to the London County Council has a salary of £2,000, while his coadjutor who has charge only of the educational buildings receives £1,200, and the same pay is given to the Principal Architect in H. M. Office of Works. The discrepancy between British and American ideas of fair play is even greater than the figures show, seeing that the cost of living there is less than it is here. It should be remembered that the architectural character of our Government buildings has a great, a very real, effect on the taste of the community, and the man who is responsible for the artistic character of these buildings deserves better pay in addition to the protection, which we now understand, *is* afforded him under the Civil Service rules.

A WATER-TANK accident of rather an unusual character occurred in Brooklyn, N. Y., last week—unusual in that it happened to a new tank, not, as is generally the case, to an old one. The tank on a factory roof, which contained twenty thousand gallons, had been filled during the day, but fortunately its supports did not crumple up under the weight until long after the work people had gone home. Then they gave way and the tank and its contained water smashed through roof and four floors to the cellar. The night-watchman, who naturally hastened to make an investigation, narrowly escaped asphyxiation from the gas that was pouring from the ruptured pipes. As a filled tank of the size indicated implies a dead weight of from eighty to ninety tons, it is obvious that its installation calls for a fair amount of engineering knowledge, and this those responsible for installing the tank in question can hardly have had.

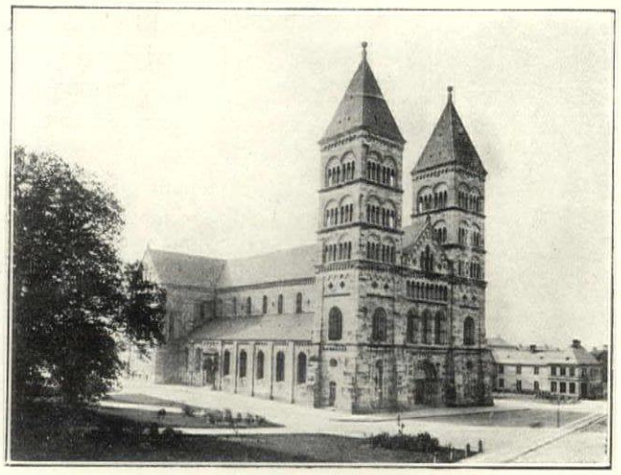
FOR several weeks we have been watching with much interest the execution in reinforced-concrete of a rather small but unusually complicated piece of work. It has seemed to us to be rather a notable instance of mistaken judgment, for within the same time the work could have been done as substantially in brickwork over and over again, and at a smaller labor cost, and we have been impressed with the fact that, except for plain walling and simple forms, the economy of employing reinforced-concrete is distinctly difficult of proof. In the case in question the work to be effected was of so complicated a character that the mechanics had, perforce, to putter wastefully over their job, but we could not observe evidence of that boasted saving through the employment of unskilled labor; for, barring a dozen Italian barrow-men, practically all of the forty or fifty men on the job were skilled mechanics, more than a score of them being carpenters employed but half-heartedly in getting out the necessary forms, only to tear them to pieces after a few days and throw the wood so used into the rubbish heap, a sheer waste. Observation of this case convinces us that there is going to be a far greater labor-cost and waste of lumber, where anything but the simplest and most repeatable units are used, than is at all suspected by architects and contractors who now are so gaily planning and contracting to build reinforced-concrete structures of every conceivable complexity of arrangement and adjustment.

AS it is the common fate of all theatres—especially of American theatres—to burn sooner or later, there are comparatively few that ever reach a venerable age. Just why the Savannah Theatre, at Savannah, Ga., escaped the common lot for nearly ninety years, we know as little as we know why it succumbed at last; but the fact that an American theatre built in 1818 was not burned down until 1906 deserves at least this record.

IF surface indications are to be trusted, a vast industrial war in the building trades may be impending. Having learned, seemingly, that frogs'-legs can enter this country over the Canadian border only on paying customs dues to the United States Treasury as "poultry," the Bricklayers' Union of Greater New York have reasoned by analogy and have then forced the Mason Builders' Association to agree that, hereafter, all the constructive work on concrete and reinforced-concrete buildings shall be done by bricklayers! Having in this modest way set one foot on the field of metallic construction, they will probably claim foothold for the other one by arguing that both bricks and aluminium are produced from clay, and, hence, that bricklayers have been from time immemorial metal-workers. Continuing their argument, they are, of course, on the verge of declaring that steel and iron are no more metals than is aluminium, that, moreover, they are about to do the metal-work for reinforced-concrete buildings, and so, henceforward, all structural metal-work must be handled by bricklayers. The logic of the situation seems to be that the pugnacious housesmiths and the equally warlike bricklayers may shortly be seen all over the city dropping bolts, brickbats and tools on one another's devoted heads.

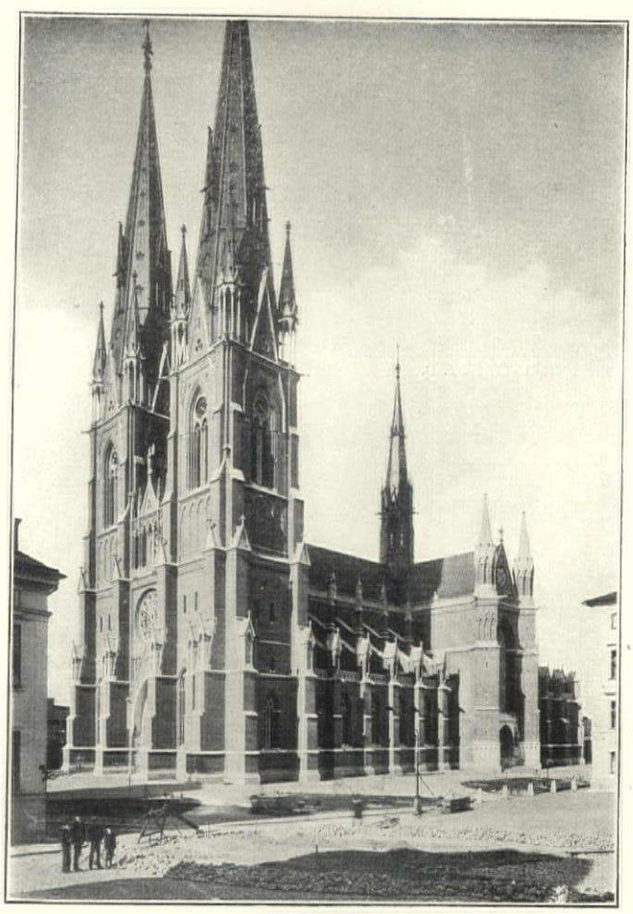
SWEDEN.—II.

FIRST comes the grandly-conceived Cathedral of Upsala, where the clerestory is treated according to the accepted rules of French church-building. In the five-aisled cathedral of Vesteras, it appears on the exterior only, and there is a suggestion of openings, but they are closed with iron shutters. The next step is seen in the three-aisled Cathedral of Strängnäs with an exterior



CATHEDRAL OF LUND, SO. SWEDEN.

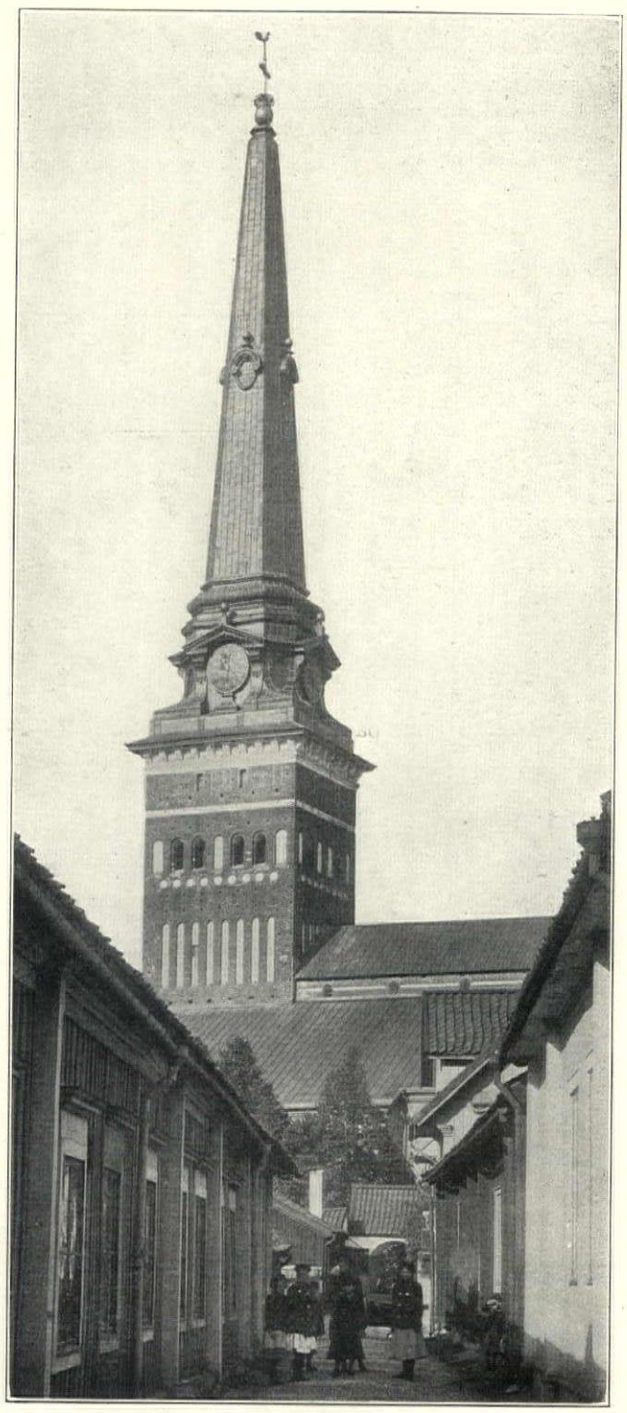
row of chapels. Here is a brick wall, breaking through the roof and treated decoratively with sunk panels plastered, but no openings. In the church of Varberg there is a mere shadow line to



CATHEDRAL OF UPSALA, RESTORED BY ZETTERVALL.

recall the former clerestory. And again, in the small country church of Aspö, there is absolutely no indication on the exterior of the three-aisled plan of the interior. Lastly, in the rather homely one-aisled church of Enköping, with, however, a pleasant interior, the clerestory arrangement reappears on the exterior, and even windows are inserted to light the space above the vaulting. This break in the roof lines is often used in the succeeding Renaissance in manor-houses and châteaux, and is a most interesting illustration of the decorative art borrowing purely constructive motives for its purposes. There is probably no feature of the native architecture more eagerly seized upon by the modern architects of every possible artistic conviction than just this, of which we know almost nothing in America.

In regard to the Mediæval styles, it is worth noting that here, as in Germany, the Romanesque type shows a wonderful persistence, being employed as late as 1250, when the French Gothic was at its best. It is true that the most pressing need for churches had, during the previous years, been pretty well supplied, and it is also quite true that something in the Northern climate and temperature corresponded better with the simpler forms of



CATHEDRAL OF VESTERAS, SWEDEN, TOWER BY N. TESSIN, JR.

the Romanesque. The finest monument of this period is the old Cathedral of Lund, with its twin towers, its sombre majestic interior and its peculiar choir, raised high to gain the imposing crypt underneath. This church has been in later years rather happily restored by Zettervall. Other larger Romanesque or transitional cathedrals are those of Linköping, Vesteras, Strängnäs, and the very elaborate church of Varnhem, a monastic structure.

There was no gradual transition from Romanesque to Gothic in Sweden, except on the Island of Gotland, which has a unique place in the history of architecture. The Gothic style was introduced full-fledged, and whereas, previously, reference has been made to English and Low German influence, it is now the Ile-de-France Gothic that dominates. Upsala was the seat of the old heathen cult. It was therefore proper that the very grandest cathedral of the North should here be erected to succeed the old heathen temples. Therefore, in 1287, Etienne de Bonneuil was brought direct from Paris, together with twenty stone-cutters and masters. He planned a copy of Notre Dame, somewhat simplified.

CASTLE OF KALMAR, SWEDEN [12TH AND 16TH CENTURIES].

It is an imposing pile, with three aisles and a fringe of chapels all around, and of noble dimensions; in length 360 feet, breadth 106, and 92 feet to the keystone of the vaulting. Notre Dame is 14 feet higher. Unfortunately, it is of brick, but the trimmings are of stone, and some sculpture still remains to speak of the skill of the French workmen, all this in spite of the very unsuccessful modern restoration. For here Zettervall fell far below the mark he set himself at Lund. The cathedral is cold and hard, and looks more like an effort in modern French Gothic than like the real thing, which it once was. The same restorer achieved better results in the Gothic cathedral of Skara, where the finely-proportioned interior, at least, has a flavor of French Mediævalism. The Cathedral of Upsala was consecrated in 1435. Various fires, rebuildings, additions, alterations and other disasters so altered its appearance that, previous to its present restoration, it looked still less like a French Gothic cathedral than it does now.

EARLY 17TH CENTURY CHURCH, KRISTIANSTAD.

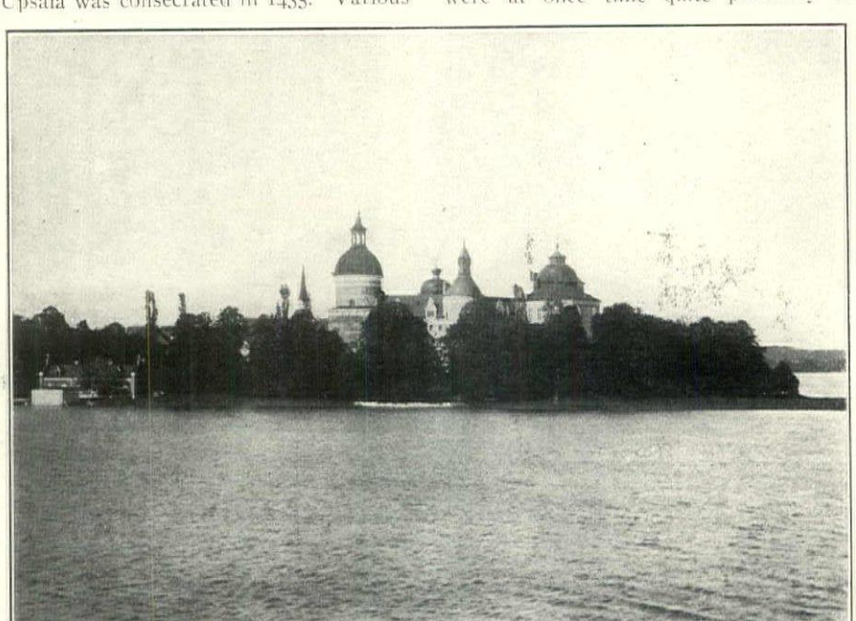
There is virtually nothing more to show of Gothic building; a little remodeling of churches and cathedrals, and, shortly before the Reformation, the monastic church of Vadstena, with three aisles of equal height, a so-called "hall" church.

As previously hinted, the Island of Gotland has an early history all its own. It is better favored in the climate, which is far milder than on the mainland. Moreover, it has rich supplies of limestone well suited for building purposes. In early days it was one of the principal members of the powerful commercial Hanse League, with Wisby as its capital. It was favored in its location, being in the direct line of trade, and it was at one time enormously wealthy. The city of Wisby was taken and sacked by King Valdemar of Denmark, 1361. This was a severe blow, from which it never recovered, and marks the beginning of decline.

There is on this comparatively small but wealthy, island a treasure-house of Mediæval art and numbers of churches, most of them now in ruins. These churches differ from other Swedish work in several respects. They are mostly one or two aisled and small, but rich in sculpture and stone carving, especially about the doorways. In fact, art here became acclimatized or popularized, so to speak, and part and parcel of the very people. Perhaps the most distinctive feature is the tower with offsets at the base, the many stories of windows and the peculiar treatment of the spires.

Then, too, Gothic construction was here more favored, and it is quite possible to trace a continuous development from the Romanesque into its succeeding style, which lacks the sporadic and exotic character, noticeable on the mainland.

There remains one more topic before leaving the subject. If, as a rule, the exteriors are plain, though, let it be remembered, quite often attractive in their unpretentiousness, the interiors were at once time quite profusely frescoed. Unfortunately, they were in most instances plastered over about a hundred years ago, when a Puritanical wave swept the country. A few escaped the devastation, and in some others the plaster has been knocked away with a patient persistence, and the original frescos "developed," as they express it. It is true that much, especially of the symbolical figures, were naïve to the verge of being crude or indecent. But it is a great pity these records of the past were obliterated. Moreover, they were infinitely to be preferred to the cold, heartlessly-bare white walls that stare the beholder in the face from every point of view. They were certainly decorative, and time has so mellowed the tints and outlines of



CASTLE OF GRIPSHOLM, SWEDEN [14TH, 15TH AND 16TH CENTURIES].

what remains that one feels a sharp pang of regret for the loss. The small illustration from Floda church gives a good idea of the pictorial character of these frescos.

RENAISSANCE.

With the Reformation the Church lost most of its power and wealth, and its building activity came to a practical standstill. The builders' energies found an outlet in another direction. The new king and the nobility started in vigorously to erect fortress-like castles, the more firmly to intrench themselves and to signalize their dominion. John III., son of Gustavus I., was the most energetic builder that ever sat on the throne of Sweden. The navy, too, received his special attention, and as a curiosity it is worth remarking that he possessed a larger navy than even England.

DETAIL: CASTLE OF GRIPSHOLM, SWEDEN.

The splendid castles of Gripsholm, Kalmar and Vadstena date from this period, and one might add Oerebro and the old palace of Stockholm, the predecessor of the present building. These structures have a very military air, with towers and turrets, moats and drawbridges. The roof-lines are also very conspicuous. Many successful motives of modern architecture can readily be traced back to these sombre and imposing feudal strongholds. Comparatively little, however, remains in anything like the original condition. There is, however, enough to show that the interiors were rich and often elaborate with paneled ceilings and dados in various designs, carvings and tapestries. This period marks the beginning of modern domestic building, and is, therefore, of special interest to the native architect. Nearly all these old-time burgs have, during the last few years, been restored with great care. This sixteenth century was in every way one of preparation for the succeeding century, the one when Sweden was a leader among nations.

Few churches indeed were erected during the Renaissance, and these seem to us as dull and lifeless as the ubiquitous churches of Rome. But there is probably not a church in Sweden which is without some memento from the seventeenth and eighteenth centuries. Many have side chapels, towers, spires or portals, appended without any thought of the incongruity of the forms. Within are altars, pulpits, monuments, tablets, pews, galleries, all in the new style, much of it good, though out of harmony. But the Gothic itself was not quite forgotten. At least in Kristianstad a Pointed church, with exceedingly slender windows and stone piers, was erected in the seventeenth century. The picturesque Flemish gables are noteworthy.

OLOF Z. CERVIN.

(To be continued.)

THE COIGNET REINFORCED-CONCRETE SYSTEM.

UNDOUBTEDLY one of the earliest workers in both the practice and theory of reinforced-concrete construction was M. Edmond Coignet, who in 1888 stated before the French Society of Civil Engineers his ideas regarding the reinforcement of concrete, and in 1894, before the same society, read a paper on methods of calculation. M. de Tedesco has for long been associated with M. Coignet. To Messrs. Coignet and de Tedesco belongs the honor of having first conducted scientific experiments which enabled a rational theory to be established of the stresses and strains in structures of reinforced-concrete, and it was from their researches and published information that M. Considère, Inspector-General of the Government Department of Ponts et Chaussées, was induced to interest himself in the subject and carry out, with Government assistance, the extended series of experiments which enabled him to so greatly assist in the determination of factors necessary to a more complete understanding by the engineering profession in general. M. Considère only confirmed, however, as regards the more important factors, results that had been previously obtained by Messrs. Coignet and de Tedesco. Naturally, with the resources which he had at his command, he was able to more fully investigate points that they had to leave for future determination, and he substantiated those facts which they had already satisfied themselves upon.

M. Coignet is not only a qualified civil engineer, but he is one of the largest contractors in France. His business was left to him by his father, M. François Coignet, and it was from the practical experience of his father that M. Coignet, with his theoretical training, was enabled to advance as he has done. His first patent was taken out in 1855 in both France and England for the making of concrete from hydraulic limes and various aggregates. "Béton aggloméré," as this lime-concrete made in a special manner was known, was also called "Béton Coignet," from its inventor and his large use of it in practical construction in Paris and elsewhere. In the English, although not in the French, patent he referred to the fact that he constructed reinforced floors with crossing rods. In 1861 this Coignet published a pamphlet which has been called his memoirs. In this he advised the introduction of metallic framework to reinforce concrete, and described its various possible applications and the manner in which he had made use of it, so that we see that he antedated Joseph Monier's patent of 1867, which only dealt with the construction of flower-pots at that time, being extended in 1873 to cover its use for reservoirs, bridges, etc.

M. François Coignet, as a contractor and inventor of Béton aggloméré, had constructed many large works in concrete, some of which were reinforced with metal. It appears that he constructed over 200 miles in France and at Odessa in Russia 38 miles, of aqueduct for the Paris water-supply from the river Vanne, five miles of which include arches from 99 ft. to 132 ft. span, the church at Vesinet, near Paris, the high retaining-walls of the Passy and Trocadéro cemeteries in Paris, a light-house 172 ft. high at Port Said in Egypt, etc. M. François Coignet died in 1887.

Of course the application of reinforcement by this contractor was purely experimental, and it was left to his son to determine the method of calculating this reinforcement. M. Edmond Coignet, who two years ago established a branch office in England, was educated at the Central School of Arts and Manufactures in Paris. From the time of his father's death the idea of reinforcing concrete with steel was slowly maturing until 1892, when the whole subject seemed to be in the air, and resulted in Cottancin, Hennebique, Bordenave, and Bonna bringing out their various special systems. In 1892 to 1893 the Ville de Paris proposed to construct the aqueduct of Achères on the old method—namely, constructing circular galleries in masonry, part above and part below ground. M. Edmond Coignet, knowing the advantages which had been obtained by the employment of reinforced-concrete, brought the matter before the authorities and offered to construct the aqueduct in reinforced-concrete at a much reduced cost over the proposed masonry design. He managed to convince the authorities of the advantages, and he was granted this im-

portant contract. The elevated portion was of circular section, 10 ft. in diameter, with external stiffening supports spaced about every 6 ft. apart; this portion was one-third mile long. The underground portion was elliptical in form, 17 ft. wide, and 1½ miles long.

From this time the application of reinforced-concrete became general and of ever-increasing magnitude in France. We may mention that the Paris International Exhibition of 1900 was the means of emphasizing the advantages of reinforced-concrete, and M. Coignet was responsible for one of the most striking demonstrations in the shape of the Château d'Eau, which was a much-admired wonder. It was only owing to the peculiar qualities of reinforced-concrete that it was possible to execute rapidly such a daring and graceful scheme. M. Coignet was granted the Grand Prix (Class 28) for his works in reinforced-concrete at this exhibition, and he also obtained the Gold Medal (Class 29) for the architectural designs of his constructions. The authority which the opinions and experience of M. Coignet have in France is shown by the fact that he is a member, both in the technical and the practical sections, of the committee which has been appointed by the Department of Public Works to draw up rules for the design of reinforced-concrete structures.

As we might naturally expect from his profound knowledge of the theory and practice of the subject, M. Coignet does not bind himself to any hard-and-fast forms of reinforcement, recognizing that special circumstances may require special treatment; yet, on the other hand, of course he has convinced opinions and has adopted certain well-defined methods of meeting ordinary conditions. The rods he uses are of round section and without any mechanical bond. In beams, M. Coignet always makes use of top as well as bottom reinforcement. The introduction of these to rods in the compressed portion of the beam adds to the compressive resistance and makes it possible to diminish the section of the concrete, thereby lessening the dead weight of the beam. Another advantage in M. Coignet's opinion is that these top rods help to strengthen a floor when subjected to fire, in so far as they suspend the bottom rods and keep them in position if they should be exposed by the action of fire and water. The third advantage is that the use of top reinforcement enables beams to be prepared in the same manner as piles, which can then be hoisted into position and made to support the centering for the slab by a special arrangement, in which case the centering may be removed after two days. The top and bottom reinforcements are connected by stirrups which serve the purpose of resisting the shear. Round rods of small section are simply turned over at the top and bound in position with annealed wire. It is obvious that a fairly good connection is thus obtained between the shear members and the longitudinal rods, and these may be depended upon to resist sliding, such as may occur with loose stirrups when the load on a beam approaches its ultimate strength. When the shear is so great as shear members, M. Coignet simply turns up one of the rods in to render it necessary to obtain some rigid connection of the an inclined direction, which he can easily do, for he generally uses a number of rods in the underside of a beam. The spacing of the shear members conforms to the general practice in being closer together toward the points of support. The floor slabs are usually made from 4 to 5 in. thick, with an armature of principal bars running in the direction of the shortest dimensions between supports, and a secondary system of crossing bars of smaller sections than the others. The crossing rods are bound together with annealed wire at every-other intersection, similar to what has been called the Monier system. When the span or the load, or both, is considerable, the slab is constructed of greater depth, and in form similar to beams with top and bottom reinforcements connected by stirrups. Where such slabs are combined with ribs, the lower principal bars do not rest on the upper compressed members of the ribs, as might be supposed from the method adopted with the beams, but run through. Another method is adopted in which the slabs are only 3 or 4 in. thick, supported by ribs spaced only a few feet apart and resting on the main beams or on the walls. This method is used principally for mills, warehouses, platforms, and generally where the loads are considerable or the spans between the supports large. These ribs are generally exposed in buildings of the factory class, though in certain cases, where the appearance is studied, a ceiling is provided and fixed to the underside of the ribs, leaving a space between. When a slab is connected with a beam, calculations are based on a T section, the slab being assumed to take part of the compression. Posts, pillars or columns are made round or square. The longitudinal bars are bound by spiral rods, spaced every 3 or 4 in., annealed wire being used to connect these at all intersections.

When the frameworks of beams are placed inside the box centering false pieces of wood are used to keep the armatures in their proper positions; the concrete is then thrown into this mould and well rammed round the bars. The principal and secondary bars for the slab are next put into position on the top of the beams, and the concreting of the slab then completed. The framework of the slab is lifted during the process of the work in order to leave the required distance between the bars and the undersurface of the floor.

As regards the method of centering adopted by M. Coignet, planks of about 1 in. thickness are generally used, and care is taken that the centering should be quite rigid in order to stand the ramming of the concrete without sagging. The portions of the centering under the slabs can be removed after a few days. The concrete used is generally in the following proportions: 3 parts Portland cement, 5 parts river sand, 10 parts ballast, broken bricks, slag or clinker aggregate. This mixture naturally contracts in volume and in the result there are about 12½ parts of concrete. The weight of such concrete, including the usual percentage of iron, is taken at about 156 lbs. per cu. ft. The cement used is slow-setting. M. Coignet takes the compressive strength of such concrete at 2,225 lbs. per sq. in., but allows in his calculations a factor-of-safety of 3½, so that 635 lbs. is considered a maximum for the fibres bearing the greatest stress in the deflected body. The reinforcement consists of mild steel with a tensile strength of about 58,000 lbs. per sq. in., with an elongation of 22 per cent. on 8 in. The same factor-of-safety—namely, 3½—is taken for steel, the maximum tensile working stress being taken is 16,600 lbs. per sq. in.—*The Builders' Journal.*

THE SEA'S RAVAGES AT MONT ST. MICHEL

ENGLISH people who know Mont St. Michel—and there must be a great many now—will be sorry to hear that it is in danger from the erosion of the sea. It is the causeway built twenty years ago to connect the island rock with the mainland which is said to be the cause. It stops the flow of the tide, which comes racing into the Bay of Cancale as fast as a horse can trot. The flood, instead of passing freely round the island, spends its curbed force in a work of destruction. The King's Tower, the bastion which comes down to the sea at the head of the causeway is, it is said, already undermined and doomed. It is suggested that a piece of the causeway nearest the island, a hundred or two hundred yards in length, should be cut away and replaced by a bridge, so as to restore to the tide its old freedom of passage.

It was a thousand pities that this causeway was ever built. It was never really necessary; nobody ever got caught in the quicksands crossing to the island unless they wandered foolhardily away from the track, and it has taken away half the charm of Mont St. Michel. Not only is the island no longer an island, but it has been vulgarized, turned into the commonest of objects of a day's excursion. Brakes and motor cars cumber the causeway, and eating-house keepers' touts badger one with loud-voiced recommendations of their masters' fare.

It was very different in the old days before the causeway. Mont St. Michel was then unsophisticated, confiding, and hospitable; Poularde's restaurant was one of the best and cheapest in France. It was a privilege to know Madame the hostess, and to be allowed to watch her make an omelette in a Gargantuan saucepan over an immense wood fire in her tiny kitchen. Her visitors'-book then was filled with well-known names, sketches by famous artists, and eulogistic verse by real poets. The only drawback to the serene joys of Mont St. Michel in those days was that one had to remember everything that one ate or drank, because Poularde apparently never booked anything. He trusted to his guests—they were guests, not customers—telling him what they owed.

A second danger also threatens Mont St. Michel, not from the sea this time, but from the land. It has been found that the immense sandy foreshore of Cancale Bay, reclaimed from the sea and fertilized with seaweed, grows excellent vegetables, which are ready for the London market even before the produce of Jersey, and the "polders" of the thrifty Norman gardeners are every year narrowing the space between Mont St. Michel and the mainland, threatening in time to change its present setting of yellow sand and blue into a green girdle of vegetables.—*London Standard.*

COMMUNICATIONS

ARCHITECTURAL PRACTICE.

WASHINGTON, D. C.

TO THE EDITORS OF THE AMERICAN ARCHITECT.

Dear Sirs:—"A lay editor on architectural competitions," in your issue of September 15th, comments quite rationally and understandingly upon the subject he discusses, though there seems one phase of the question that he thought not of. And perhaps, too, I do not read aright the handwriting that I think I see upon the wall.

The architect of to-day is no longer deemed purely an artist; he is a professional man, having some artistic instinct or employing some artistic assistants. As a professional man he has cheapened himself, by competitions and various other processes, away below the standard of any of the other professions, and more is expected of him and less respect shown him than to the members of any other of the so-called "learned professions." Then, too, he has much to do with business, but the business community does not look upon him with any very high regard. Mark you, I am speaking of the average architect. His anxiety for work has been such that he has belittled himself in his vicinage. Through that same anxiety, or through lack of intimate knowledge of the subject, his estimates of cost have been so inaccurate that people mistrust him, and few clients to-day will ever tell their architect the real maximum they intend to spend on a building. They feel that he will reach it soon enough, and will therefore fib to him and try to keep him down in that way.

The complexities of our civilization are such and the requirements of our buildings have become so exacting, that everything is specialized nowadays, and an architect is really but a clearing-house, one might say, for a great number of contributory building specialists. And the job has grown almost too big for him.

Business men in the building lines have been prompt in noting all this. They are forging to the front and usurping prerogatives that architects considered all their own. Being primarily business men,they know how to handle business propositions in a business-like way, and the result is that other business men having building projects in mind naturally seek to deal direct with such building corporations, business institutions themselves, and without the intermediary of the architect. True, one is generally employed. His duties, however, are more or less perfunctory, and he becomes very much of a second fiddle upon a building—compared to what he used to be in times gone by, when Mr. Architect was as much of an autocrat on a building as is a captain upon a ship at sea.

Perhaps it is all wrong, and then, too, it may be a most natural, legitimate, and even commendable evolution. But does it not point to the ultimate elimination of the architect as an independent factor and the profession of architecture from among the learned professions? How much of a step is it from the present mere "retaining" of an architect upon those big commercial buildings to a time when the building companies will openly and boldly employ skilled designers, artists, upon their own staffs, and do all of the work of designing and building *sans* Mr. Architect?

People say now that the artistic designer in nine cases out of ten is but an employé of the successful business architect. Why should he not be employed by a building company just as well? And would the buildings so conceived suffer architecturally any more than they do under the present régime?

I well remember the time when every railroad had a professional bridge designer. He made his plans for the bridges and the bridge-companies respectfully submitted bids for work to be done in accordance therewith. These companies grew, and there came a time when the railroad, instead of making the designs, simply stated that it wanted a bridge over such a river, to carry so much traffic, and the companies submitted bids, designs and all, fully guaranteed to fulfil conditions for so much money. People prophesied dire things as a result of that innovation, but to-day we have better, stronger, handsomer bridges than ever before, and the process of handling them has proved a success to all concerned.

Why will not the new way of building be as successful? That it has been inaugurated is altogether the architects' fault, the practice of the profession has been an anomalous affair, unbusinesslike and neither flesh, fish, nor good red-herring.

Only very recently have the brethren banded together in closer union. Until then, it was a sort of cut-throat affair. The American Institute, the architectural press, and other agencies have been at work to elevate the standard of practice somewhat. Perhaps it is all too late. There may be still time to counteract the work of years and to re-establish the craft on a firm footing. It would seem to me, however, an interested onlooker, intimately familiar with all the conditions, that it would be far better to eliminate the species of trade-union spirit in conventions and meetings that seems to prevail, the discussion of the 5 per cent.—that is so seldom exacted—and all that sort of thing, and the bending of every energy toward improving the morale of the practitioners and raising the standard of the profession to a point where its practitioners would, at least, receive the same respect and esteem that is accorded the doctor and the lawyer.

F. W. FITZPATRICK.

[We do not consider our correspondent right when he intimates that architects do not enjoy "the same respect and esteem that is accorded the doctor and the lawyer."—EDS. AMERICAN ARCHITECT.]

THE SUPERVISING ARCHITECT'S TENURE OF OFFICE.

Treasury Department, Washington, D. C., Sept. 24, 1906.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs:—In your editorial of September 1st, relative to the office under my charge, I observe that you state "that you understand that the Civil Service extends to all except the head of the office."

In 1897 Secretary Gage, with the authority of the President, extended the above rules to cover that position also, and I have the honor of being the first to occupy the position under Civil Service rules, having been appointed after a full examination taken by about forty fellow-members of my profession.

Believing that you should have this information, and thanking you for your article, I am Yours truly,

J. K. TAYLOR, *Supervising Architect.*

"ALCOVE ROOMS."

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs:—The various comments which have appeared in your editorial columns on the controversy now going on between the Brooklyn Society of Architects and the Tenement-house Bureau appear to ignore the fact that the Society is simply taking its stand on a position established by the Bureau in issuing permits for a period of several years for a class of plans which they now, without notice to the profession, as to the general public, declare to be in contravention of the law. In the first place this is clearly an act of self-stultification on the part of the Bureau, and that alone is a sufficient explanation of the hesitancy displayed in not returning these plans as disapproved. The fact that an up-State Judge has been found with liberal ideas as to light and ventilation—laudable enough in themselves—to sustain the Bureau in their later but altogether inconsistent interpretation of the law, is no proof whatever of the soundness of that interpretation from a legal standpoint. Since the course adopted by the Bureau in holding up some 200 plans without notice, as already stated, involves a distinct act of injustice to a considerable number of architects who in perfect good faith and at considerable expense to themselves, and under contract with their clients, have prepared and submitted the said plans, your well-meant advice to these gentlemen not to "waste time in trying to find some court that will take a different view," seems to be at least a little premature. The present writer happens not to be among the number of those whose plans are now being held up, although he has probably lost a client through his inability to comply with the latter's requirements under the latest ruling of the Bureau; he may, therefore, be assumed to take a disinterested view of the matter.

Your further suggestion that the Society "would do better to unite in bringing about a permanent cure for the greater part of the evils of tenement-house planning" by urging a certain amendment to the law, may be, and probably is, in itself a good one, but in the first place it involves an implied admission on your part that it is the law, not the Brooklyn Society of Architects, which is at fault in this matter; and in the next place it would establish a very pernicious precedent by framing an amendment to the law as it now stands with a retroactive force, involving the infliction of an injustice upon those whose plans are being held up at considerable loss and inconvenience to them and the public whom they represent.

This whole controversy turns upon the technical question, What is an alcove-room? Yours is a technical paper, and there should hardly be any dispute with you on such a question. An alcove-room is a room with an alcove in it, and so long as such a room

has 10 per cent. of its floor area in clear window space it undoubtedly complies with the law. Such, at least, has been the ruling of the Tenement-house Bureau hitherto. Now and henceforth, however, their interpretation of an alcove-room is to be a room which in itself is an alcove. Need I say that such an interpretation is neither architecturally nor legally the correct one?

Yours truly, C. WHITLEY MULLIN.

Brooklyn, Sept. 25, 1906.

[Our correspondent can hardly argue that simply because things have been they are necessarily right and must not be changed; there could be no progress or evolution else. For the intelligence and honesty of the gentlemen who occupy the New York Bench we have too much respect to believe that there is much difference in these regards between an "up-State judge" and one who sits below the Harlem. The change in ruling seems to have been needlessly mismanaged, but that does not militate against its essential propriety; mistaken rulings are being rectified daily everywhere and lawyers, at least, rejoice that this is so.—EDS. AM. ARCHITECT.]

ILLUSTRATIONS

UNION (TRACTION) STATION, GEORGETOWN, D. C. MR. W. B. WOOD, ARCHITECT, WASHINGTON, D. C.

BASE OF THE TOWER OF THE SAME.

NATIONAL CATHEDRAL SCHOOL, WASHINGTON, D. C. MR. R. W. GIBSON, ARCHITECT, NEW YORK, N. Y.

GENERAL VIEW AND ARCADING OF THE SAME.

ENTRANCE PAVILION OF THE SAME.

HOUSE OF HERBERT WADSWORTH, ESQ., 5003 MASSACHUSETTS AVE., WASHINGTON, D. C.

PORTE COCHÈRE OF THE SAME.

UNION TRUST AND STORAGE COMPANY'S BUILDING, WASHINGTON, D. C. MESSRS. MARCH & PETER, ARCHITECTS, WASHINGTON, D. C.:

FRITZ REUTER'S, PENNA. AVE., WASHINGTON, D. C.

MR. G. A. POHL, ARCHITECT, WASHINGTON, D. C.

Additional Illustrations in the International Edition.

DETAIL: NATIONAL CATHEDRAL SCHOOL, WASHINGTON, D. C. MR. R. W. GIBSON, ARCHITECT, NEW YORK, N. Y. MR. L. AMATEIS, SCULPTOR, WASHINGTON, D. C.

NOTES AND CLIPPINGS

REGILDING THE BOSTON STATE-HOUSE DOME.—The Sergeant-at-Arms of the Massachusetts Legislature has completed arrangements with Nathaniel G. Finney, of Boston, for regilding the dome of the State-house. The contract calls for the removal of all the gold-leaf and paint at present on the dome and extreme top of the cupola and the repainting of the whole with two coats of the best yellow ochre and oil, and regilding with not less than 23-carat gold. The contract also calls for the completion of the work on or before the first day of November. The dome is 53 feet in diameter and 35 feet high, and for many years after its erection it was simply painted, but Governor Nathaniel P. Banks, in his valedictory address to the Legislature, delivered on January 3, 1861, recommended that it be gilded. No action was taken upon this recommendation until 1874, when the Legislature ordered that the dome be gilded, and it was necessary to regild it in 1888. Mr. Finney, the present contractor, did the work at that time, at a total expense of $4,758. The dome was renovated in 1898.—*Boston Transcript.*

FALL OF A FLINT TOWER.—The tower of the Perpendicular Church of Burlingham St. Peter, between Yarmouth and Norwich, collapsed suddenly on Tuesday evening. The fabric of the church, which was greatly damaged, was built of flint, with stone dressings, during the 15th century, and was restored in 1874 at a cost of £2,306. The west end of the church has been left open right into the nave, the walls of which have been cracked and bulged to such an extent that unless they receive speedy attention the ruin will be extended. The falling masonry utterly demolished the gallery, and the clock and three bells lie buried in the débris. The flints have come so clean out of the mortar that an expert regards it as wonderful that the building should have stood so long as 400 years.—*Building News.*

"THE SHAMBLES," YORK, ENG.—One of York's antiquities, "The Shambles," has met with adverse criticism, and even censure, at the hands of Mrs. Macdonald, the wife of Mr. J. Ramsey Macdonald, M.P. The Shambles is a short, narrow street in the center of the city. The buildings are among the oldest inhabited in the city, and are of the type common in former days, with the upper rooms projecting over the causeway, so that from the windows it is almost possible to shake hands across the street. It is the quarter in which the butchering trade used to be carried on, and butchers tenant the property to this day in great proportion. Thousands of tourists visit the Shambles every year, and to Americans, in particular, it is a never-failing source of interest. Mrs. Macdonald visited York on the occasion of the British Association meetings a month ago, and her impressions of the Shambles were contributed a day or two since to the local organ of the Labor party. She criticises the buildings particularly on sanitary grounds. Her serious charges have caused a flutter in the municipal dovecote, and it is probable the City Council will make a statement on the matter. Meanwhile parties concerned have indignantly denied Mrs. Macdonald's assertions and invited investigation.—*Building News.*

THOMAS HARDY STILL PRACTISING.—Mr. Thomas Hardy, the novelist and dramatist, who began life as an architect, has shown in a singularly pleasing way that he has not lost his old skill in the profession. He has started a scheme for adding a tower to Holy Trinity Church, Dorchester, to be placed at the southwest angle of the church, and has sent to the rector, Canon Rowland Hill, a clever sketch of his proposal, "made in an idle moment." He hopes it may stimulate some wealthy lover of architecture to carry out the idea, and he adds: "The church is sadly deficient in external dignity at present, and no stranger in passing by it can realize that so large a church stands there."—*Building News.*

IDENTIFICATION OF THE REMAINS OF LEONARDO DA VINCI.—Even the exacting Dr. Johnson was not disposed to demand perfect veracity in lapidary inscriptions; still, the scientific virus has so permeated us that we prefer at least to shed our tears over the right grave. In 1863 Arsène Houssaye discovered what he believed to be the grave of Leonardo da Vinci at Amboise, and had the remains removed to the modern church where there is a monument to him. According to tradition, Leonardo, who died in 1519, "in the arms of Francis I." (a doubtful legend), was buried in the Church of St. Florentin. This church was demolished a century ago, its site being leveled to form a little square. Houssaye had a theory that the coffins, which were in the crypt of the church, might not have been removed; and so he dug for them, and in due time came to a lead coffin containing the skeleton of a man five feet six inches tall (Leonardo's height) and a skull greatly resembling the shape of Leonardo's head, in the portrait by himself painted in his old age. Houssaye found also bits of a gravestone on which he could decipher the letters I. N. C. and E. O., which he naturally assumed formed part of VINCI and of LEOnardo. Still Houssaye did not succeed in persuading everybody that he had indeed recovered the bones of the great artist, and now we learn that a new excavation is to be made at Amboise in the hope of settling the question.—*New York Evening Post.*

JAMES WYATT, R.A.—The great revival of interest in Gothic architecture was largely due to James Wyatt, R.A., who became almost, if not quite, president of the Royal Academy. "Even his enemies admitted that he was president-elect. He built the mansion at Heaton Park in 1772 for Sir Thomas Egerton (afterward the first Earl of Wilton), but can hardly be described as a Manchester artist. A *protégé* of Lord Bagot, Ambassador to the Pope, he was taken to Rome to study architecture, where Wyatt made good use of his four years' stay, subsequently spending two years in Venice. Four years later he was elected an Associate of the Royal Academy, and afterward duly became an Academician. He successfully adapted the old Pantheon in Oxford Street, London, for dramatic performances, and hence rapidly rose in popularity. In 1795 he erected Fonthill Abbey for Mr. Beckford. He was concerned in the restoration of Hereford, Lincoln, Salisbury, and Lichfield Cathedrals. It has been well said 'there is scarcely a county or large town in the country in which Wyatt did not erect some public or private building.' He was killed by a carriage accident near Marlborough in his 68th year, and was buried in Westminster Abbey on the 28th of September, 1813."—*Manchester Guardian.*

The American Architect and Building News.

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SOCIETIES, PERSONAL MENTION, ETC.

PHILOLOGY is an entrancing study, especially since simplified spelling has come to throw its light on the darker problems. Through its aid we have the right clue at last to that puzzling word, "Capitol," and can derive these rightful permutations: Capitol, State-house, ship-of-State, *navis*, knavery, home of thieves! If one keeps in mind this illuminating bit of lore, the history of the Capitol at Harrisburg, which was dedicated with fitting ceremonies during the present week, will seem not so much revolting as brutally natural; though ceremonies that would really comport with the building and its history would have to be an orgie that could be seen safely only from the galleries. When, in February, 1897, the old building was burned, the Legislature at once enacted into statute law that there should be built and delivered, complete, a fireproof Capitol, ready for the next Legislative session, and that its cost should not exceed $550,000. At the appointed time there was delivered by the architect and contractors a building that was accepted by the Legislature as the "complete" and "fireproof" building required by the law. In face of this acceptance, could any one doubt that architect, builders and building-commission had achieved a singular success? No, because it was singular; inexpressibly so. But, curious as it was, it is not nearly so odd as the fact that some six years later this building, already accepted and dedicated as complete and fireproof, was again dedicated on the fourth current, and that its cost is a matter which apparently cannot be got at. A few weeks ago the administration newspapers made a great boast that, out of the appropriation of $4,000,000, the building-commission would be able to turn back to the treasury an unexpended balance of $400,000. The opposition papers at once pointed out that this attempt to make the public believe the cost was less than the appropriation was a sham, since this sum did not cover the cost of heating and ventilation, decoration, furnishing, terracing, vaults, etc. More recently still an official statement has been issued by the building-commission which states the cost as $12,601,922.18, which is quite another story than the $550,000 for the building the Legislature in 1897 knew would be good enough for their quadrennial sessions. But there seems reason for doubting whether the building-commission itself knows what the cost is, for the State Treasurer, the member of the commission who, of all others, should know most about the actual cost, has declined to sign his name to the report!

WE doubt if any building in this country, or elsewhere, is burdened with so unpleasant a history as overshadows the new State-house for Pennsylvania. The first competition was fairly conducted and adjudged, but the politicians would not allow it to stand, and a second competition was ordered, competitors being allowed ten days or so. Angered by the evidence given of intentional unfair play, the Philadelphia Chapter, A. I. A., succeeded in inducing the greater number of the architects of the State to have nothing to do with the affair. Mr. Henry Ives Cobb won this second competition, and the complete and fireproof Capitol he produced at the appointed time was nothing but a shell of rough brickwork, palpably awaiting its outside lining of marble, and unmistakably confessing itself to be but the central portion of a State-house building of the standard type, which needed wings for its completion, while the interior, crudely treated as it was, showed that up to that point the building certainly was not fireproof. How it came about that, after in this way having given proof that he understood the problem as his employers understood it, Mr. Cobb was not allowed later to carry on the work, we have never understood: but he was not, and a third competition had to be held—again without the aid and countenance of the great majority of Pennsylvania architects. This competition was won by Mr. J. M. Huston, who incorporated into his own design Mr. Cobb's central body, and who only a few days ago was acclaimed throughout the State an architect of unusual ability, seeing that he had built a four-million-dollar Capitol and had four hundred thousand dollars unexpended!

AS byplays to the main drama, we have suits brought against the Building Commission by certain competitors in the first competition, because they didn't win. We find an attempt made to send Mr. Cobb to Coventry because he did win. We find one of the oldest and most respected architects of Philadelphia expelled from the Philadelphia Chapter because he chose to consider he was not subject to trade-union principles, and elected to enter the third competition. We find, shortly after, the man upon whom this stigma had been so needlessly placed suing in the courts, and successfully suing, for reinstatement in his membership in the said Chapter. We have the scandal of the bronze doors decorated with the busts of "machine" bosses and their ilk. We find the noble trees in the Capitol Park saved from the axe only by the most strenuous efforts of the ladies of Harrisburg, who valued their umbrageous charms far above those of the most ornate stone wall and terracing that Mr. Huston could devise, and we could keep on a long time reciting similar regrettable facts which this building has occasioned. In

Entered at the Post-Office at New York as second-class matter.

spite of universal surprise at finding the building has already cost eight millions more than was announced to be the case, the newspapers make a gallant attempt to believe it has all been honestly expended. At the same time the *Public Ledger* declares that "the idea of putting two million dollars of lighting-fixtures into a four-million building is so astounding as to baffle criticism." Perhaps when the State Treasurer is ready to turn on his light, even this may be explained.

MANY an architect, who, in the spirit of old-fashioned courtesy, has found himself obliged to waste time at the opening ceremonies of some important public building he has designed, must have chuckled inwardly as, finding himself as unconsidered as a bridegroom at a wedding breakfast, he contrasted his fate with Mr. Pecksniff's. In the same way, Mr. Henry M. Shrady, sculptor of an unusually good equestrian statue of Washington that was unveiled in Brooklyn last week, may have smiled grimly when in some newspaper accounts of the event he found no mention of his name as the creator of the monument, while full particulars were given about Mr. James R. Howe, who paid for it. For the latter exploitation there was good reason, and the story is interesting and unusual enough to record. Feeling, with many other good citizens, that the fee system which provided for the payment of certain important officials of King's County was iniquitous in itself and burdensome on the public—the fees sometimes being equivalent to an annual salary of fifty thousand dollars—Mr. Howe secured election as Register on his promise that he would return to the public all the fees collected during his term of office, less what he found to be a reasonable salary for the work his office actually imposed on him. As the law still remained in operation, the fees had to be paid to and accepted by him, and people waited with interest to learn how large a sum would be refunded. Whether such was his intention at the outset, or whether Mr. Howe later perceived there was more than one way of interpreting his ante-election pledges, we do not know, but the fact is that he decided that, instead of refunding the unearned increment in cash, he would give the public the full benefit of it by erecting for their pleasure the best monument that could be procured. This was done, and if there was a little flavor of the late Phineas T. Barnum's methods in the procedure, the citizens can afford to overlook it in face of the excellent statue that immortalizes Washington as well as Mr. Howe, and in view of the fact that Mr. Howe's action has brought about the disestablishment of the fee system.

BUT all architects do not have the discomfort of finding themselves entirely outclassed at ceremonial occasions by the humblest member of the political building-committee. During the prolonged ceremonies that marked the opening of the great group of new buildings for the Harvard Medical School, in the Fenway, Boston, Mr. Charles A. Coolidge, of the firm of Shepley, Rutan & Coolidge, the architects of the buildings, had the unexpected pleasure of being called on to stand up and receive the degree of Doctor of Arts at the hands of the president of his own *alma mater*, a degree that has taken on a new significance since the establishment at Harvard of the "courses in Fine Arts," and particularly since the opening of the School of Architecture. Mr. Coolidge was formerly fortunate enough to receive, as being the designer of the United States Building at the last Paris Exposition, a decoration from the French government; but we fancy he will cherish more highly the honor he has just received, although it is not one he can wear in his buttonhole.

DOCTORS and physiologists are inclined to unite in recognizing as an important, if not the most important, factor in the very notable physical change that has taken place in American mankind during the last sixty years, the fact that Americans to-day have much better food and a far greater variety of it than their fathers had. The kitchen and the needs of the ministering spirits that there preside have been pretty thoroughly mastered by architects who, if not leaders in the reform, have at least been good forwarders of it; but we doubt if many architects yet realize that a kitchen may nowadays be held as a proper adjunct of almost every building that they are called upon to plan. The bountiful market of canned stuff, and the improved apparatus for burning fuel-gas, make it possible to install a very serviceable kitchen in a very small space. Probably no architect nowadays would plan a bachelor's apartment-house without arranging certain suites in such a way that a kitchenette could be installed, if the tenant wished. There are indications that the same sort of provision should be made in office-buildings and commercial buildings, and a busy man, who is not able to spare the time to go out to club or restaurant, and who has no relish for the half-warm lunch he can have sent in from outside, might relish the suggestion that a kitchen could be introduced in the planning of his office. The department-stores and the great insurance offices have had kitchens and dining-rooms in operation for years, and we believe that, now, commercial clients—banks, corporations and large mercantile houses—would be glad to have their architects incorporate in the plans of their buildings a well-appointed kitchen capable of meeting the noonday needs of the head officials of the concern. It might not be bootless to ask such clients: "Shall we include a kitchen?"

IT is welcome news that, at last, bids have been received in Boston for the construction of another, a large and important, section of the Charles River Embankment, the first that will begin to give actual shape to the Charles River Basin that is to become such an important feature amongst that city's attractions. If now and then some Bostonians wish that more Western "hustle" could be injected into the conduct of public affairs, they very shortly come to realize that the desirable improvements are being carried out, and in a much better way for the city's permanent benefit than if they had been put in hand at the first suggestion and rushed to completion with all possible speed.

HEATING-APPARATUS—I.

DURING the early fall of each year architects frequently hear from friends and clients, "What is the best furnace?" or, perhaps, "What shall I put in to heat my house?" The injudicious architect is apt to reply to this question with a promptness which he sometimes has occasion to repent of afterwards; for few things are more difficult than to adapt satisfactorily a heating-apparatus to the requirements, or, possibly, the whims, of the people who are to use it. One person has a very large house to warm; another has a small one; a third has a passion for fresh air, and is not happy unless he feels a breeze constantly blowing upon him; while a fourth lives in deadly fear of draughts. A fifth cannot breathe in an atmosphere which is not kept constantly moist; while a sixth takes cold in such an atmosphere; and, of the seventh and eighth, one requires an average temperature of eighty degrees in his house in winter, while the other is uncomfortably warm with the thermometer at sixty. Of course, none of these people mention their abnormal tastes, and it is left to the architect to divine what they really want, and to supply it, according to his judgment and experience, without offending them by appearing to notice their eccentricities.

In general, tall, thin and old people like to be warm. Their circulation is poor, and their feet and hands, in consequence, disposed to be cold. Moreover, as their respiration is apt to be superficial, in correspondence with the sluggish action of the heart, they are, as a rule, less sensitive to impure air than persons of more vigorous constitution. Such people, therefore, usually, although not always, prefer a powerful heater, such as a wrought-iron furnace, or direct steam radiation, either of which affords them an opportunity for warming their feet and hands, at the same time that they breathe a hot, stimulating atmosphere.

Where people of this temperament are happy, those of a more vigorous constitution are wretched. Such persons, coming, in winter, from a brisk, healthful walk into a room suited to an old or anæmic subject, break out into a perspiration which is not only annoying, but dangerous; their heads throb with the stimulus imparted by the heat to the circulation, and they gasp for the oxygen to which their lungs are accustomed.

Children, again, require special treatment. Being active, and having rapid circulation and sensitive lungs, they need plenty of fresh air, at a temperature not too high; but they have little power of resistance to cold, and a chilly atmosphere, in rooms for their use, must be avoided. It is to be remembered, also, in arranging for children's day-rooms, that the little people live in the stratum of air next the floor, which is always at a lower temperature than that in which their elders move, and is often so much cooler than the air above it that young children, playing on the floor, may be seen with their hands and faces blue with cold, while the grown people about them are perfectly comfortable.

For children's rooms, the sovereign remedy for this state of affairs, which, in conjunction with the cruel fashion of dressing babies so as to show their little bare legs and arms, has brought desolation to many a household, is to provide an open fire. A simple fire on andirons, in a brick or soapstone fireplace, is a rather inefficient heater for our climate, so that warm air should, in addition, be brought into the room from a register, or around the fireplace itself; or a jacketed open stove, with air-supply from outside, may be substituted for the fireplace. By any of these devices not only is the atmosphere of the room kept pure, and at a comfortable temperature, but the floor in front of the fireplace or open stove is warmed by direct radiation from the blazing fuel, so that it imparts warmth to the little limbs, instead of chilling them, at the same time that the temperature of the general atmosphere of the room may be kept low enough to avoid debilitating the children. Of course, little children must be kept from falling into the fire, or trying experiments with it, by an efficient guard. This will generally have to be made to order, as nothing suitable is kept in stock, and should be three feet high, of heavy wire netting, in an iron frame, forming three sides of a square, about three feet on each side. Such a screen will be heavy enough not to be easily tipped over, and will keep the children at a sufficient distance from the fire, while it can be bronzed or painted, so as to be inoffensive in appearance.

Grown people, especially invalids, would often find advantage in the cheerful radiation, and the rapid change of air, afforded by an open fire; but an open fire involves labor and expense, and is not usually sufficient for comfort in the American winter climate, so that some form of what the Germans call "central heating" is practically indispensable for our houses; and, as the central apparatus is generally presumed to have capacity enough for warming the house without aid from open fires, the latter have come to be looked upon as luxuries, to be only sparingly indulged in.

A generation ago, the most common device for central heating in American houses was the "hall stove," a large sheet-iron stove, set up in the staircase hall, often with its smoke-pipe carried up through the well of the staircase, as additional heating surface, nearly to the top of the house. Although the sight of one of these stoves, with its red-hot funnel carried up twenty or thirty feet through the narrow well-room of a pine staircase, was calculated to give an insurance man bad dreams for a week afterward, they were useful in furnishing a supply of warm air in the middle of the house, which could be admitted to the rooms by opening the doors; and they were simple, cheap, and easily kept in order. The successor of the hall stove was the brick-set furnace, many examples of which are still doing duty, after twenty years or more of useful existence. Although much more expensive than the hall stove, the brick-set furnace, placed in the cellar, had the advantage of being out of the way, while the tin pipes leading from it supplied the various rooms with warm air directly, and more satisfactorily than was possible where it was necessary to keep the doors open to let in warm air from the hall.

As usually built, the brick-set furnace consisted of an inclosure of brick walls, five or six feet square, covered with brickwork, laid on iron bars, which rested on the walls. The walls were usually made double, with an air-space four inches wide, to prevent loss of heat. The tin hot-air pipes were built through the brick covering, and the air was heated by a complication of corrugated or spiked surfaces and convoluted smoke-pipes inside. The earlier furnaces of this sort were made with heavy castings, and were very well designed for utilizing as much of the heat of the fuel as possible. Their capacity was, however, notwithstanding their bulk, comparatively small, and they were intended to be operated at a high temperature. With the wood-burning patterns, which were often used, the air delivered from the registers was frequently hot enough to set fire to a match, and a comparatively small proportion of air at this temperature was sufficient, mixed with the other air of a room, to bring the whole to the desired average. Very commonly, the air to supply the registers was taken directly from the cellar; but people who had whims on the subject of ventilation, sometimes insisted on having "air-drains" provided, by which a limited amount of fresh air was brought from the back yard, under the cellar floor, to the air-chamber of the furnace.

By degrees, architects and householders became dissatisfied with this form of heating-apparatus. The intense fire which it was necessary to keep up in such furnaces heated the cellar, notwithstanding the double walls of the setting; the mass of brickwork was accused of "absorbing" a quantity of heat which did not belong to it, but ought to be transmitted to the rooms above; and people began to find that their registers delivered to them "burnt smells," "carbonized dust," "scorched air," "carbonic oxide," and many other unpleasant things, in place of the "June atmosphere" which the furnace advertisements had led them to expect.

The first attempts at correcting the imperfections of the furnace air took the form of supplying it with moisture. Not only were water-pans inserted in the air-chamber of the furnace and kept sedulously filled with water, but dish-pans and tin wash-basins were to be seen standing on the registers in houses which aspired to the reputation of being the home of advanced intelligence, and huge sponges or towels soaked with water were often hung in the room to increase the evaporating surface. The care of all this apparatus was, however, a serious burden to the housekeeper, and the virulence of the air-moistening fever soon disappeared. Meanwhile the designers of furnaces, recognizing the advantages of increasing the supply of air and reducing the temperature proportionately, had modified their patterns, and, little by little, the modern type of hot-air furnace was evolved.

As now made, furnaces for central heating in dwelling-houses combine, in a greater or less degree, the best features of the various types which have preceded them. In the old brick-set furnaces, which contained a complication of heating surfaces, flues, pipes and domes, it was often found that a part of the pipes were useless, the smoke and heated gases taking a short cut through the nearest, and leaving the others cold. To prevent this the flues were, in certain cases, constricted, so as to force the smoke to divide itself among them; but this device had some practical inconveniences and was not always effective. At the same time that manufacturers were beginning to find defects in the multiplied radiating members of the old furnaces, a sudden outcry was raised against the use of cast-iron for heating, on the ground that carbonic oxide passed freely through its "pores" and affected the health of persons breathing air warmed by it. Although this notion was afterward completely disproved, it seized upon the popular imagination, and a demand arose for wrought-iron furnaces, with riveted joints, which would be impervious to noxious gases.

The first furnaces put upon the market in response to this demand consisted simply of a cast-iron fire-pot, lined with fire-brick, upon the top of which was set an inverted tub of boiler iron, with riveted joints, having a smoke-pipe issuing from it, the whole being inclosed in a casing of galvanized iron. Air was brought in between the fire-pot, with its boiler-iron "dome," and the galvanized-iron casing, and escaped, after warming itself by contact with the hot surfaces, through tin pipes carried from the top of the casing to the various rooms. Nothing could be simpler, and under suitable conditions this form was, and still is, very effective. It is, however, applicable, in its simplest form, only to small houses, or, at least, to houses which, like summer cottages, are provided with only a small number of registers. The quantity of air which can pass up between the casing and the dome of a furnace of this sort and become warmed by actual contact with the hot surfaces is very limited, and to try to distribute it among a large number of registers results only in disappointment, where the same furnace would supply a small number of registers with satisfaction to everybody concerned.

Although these very simple wrought-iron furnaces will supply two or three rooms with warm air with remarkable certainty and effectiveness and are less affected than those with more extended radiating-surface by sudden changes of wind, the comparative smallness of their capacity has led to modifications in them, for the sake of increasing the amount of air which can be warmed by passing through them, and thus enabling them to supply a larger number of rooms. In a good and inexpensive modern furnace this end is attained by giving the wrought-iron dome the form of a short telescope, the casing remaining cylindrical. With this arrangement a larger quantity of air can be admitted under the casing, as that which fails to come into actual contact with the surface of the dome or the casing accumulates in the space around the upper segment of the dome and either comes in contact there with the upper surfaces of the dome, or has time to mix with the hotter air which has been in such contact before issuing from the registers.

This modification, although it increases very sensibly the heating capacity of the furnace, without interfering with its good qualities, does not confer upon it the ability to supply hot air for a large house, and, for this purpose, the heating-surfaces must be again increased, so that more air can be brought in, with the certainty that none can escape through the tin pipes above without coming in actual contact with hot iron. After many experiments, furnace manufacturers have very generally adopted as the best type of furnace of moderate cost, for houses of comparatively limited size, a type in which a large fire-pot, roughly hemispherical in shape, is surmounted by a dome, and this again by a ring-shaped flue, through which the smoke and hot gases from the dome are conducted, and from which they escape to the chimney. In a furnace of this sort the air admitted between the fire-pot and the galvanized-iron casing, now generally substituted for the brick casing of the past generation, passes upward, warming itself by contact with the walls of the fire-pot and dome, and the inner surface of the casing, until it comes into collision with the annular flue, which extends out over the space in which the air has been traveling, almost to the casing. The interposition of this hot obstacle in the path of the air practically insures the collision with it, and consequent warming of whatever air may have escaped contact with the heated surfaces below; but, to make assurance still more sure, the air is then led, before it can reach the tin heating-pipes, laterally along the underside of the hot annular flue, to openings in the middle, through which it rises freely to the outlets provided for it. By this means a large amount of air is warmed with rapidity and certainty and is delivered very freely into the heating-pipes.

Although different makers adopt variations on this general type, some making the annular flue deep and some shallow, some constructing it of cast-iron and some of wrought-iron, some corrugating the dome and fire-pot to increase their heating-surface, and some leaving one or both of them smooth, the principle is the same in all, and the ease with which the annular flue is cleaned out, the evenness of distribution of the hot gases through it, and the certainty with which it intercepts and warms the air without too much checking its flow, make it, perhaps, the most valuable improvement ever introduced into furnaces for houses of moderate dimensions.

For very large houses, however, even greater air-warming capacity is required, and a furnace which would heat in a perfectly satisfactory manner eight or nine rooms may, if called upon to supply warm air to fifteen, fail to keep any of them comfortable, for the reason that the additional heating-pipes draw from the furnace a certain amount of warm air, which is chilled in its feeble progress through them and fails to produce any satisfactory effect in the rooms which they supply, at the same time that the subtraction of this warm air from the supply to the other rooms prevents them from being warmed. It is therefore essential, where a large house is to be heated, to provide for the introduction of an adequate supply of air. All this air must be warmed by actual contact with a heated surface before it enters the room, and for this purpose the furnace must present a large amount of heating-surface. It is useless to give a wide space between an ordinary furnace and the casing so that a large amount of air can pass, trusting to keeping up a hot fire to warm it all, the result of this being simply to supply hot air to the registers most favorably situated and cold air to the others.

For large furnaces, therefore, a certain complication of heating parts is necessary, in order to extend them sufficiently to intercept and heat a large volume of air. In several excellent furnaces large pipes or flues, either straight or curved, are provided, passing through the fire-dome and opening at top and bottom into the air-chamber. The air from the lower part of the air-chamber passes up through these flues and issues from the top, heated by its journey through and over the fire, and joins in the upper part of the air-chamber the portion which has ascended between the furnace and the casing. The capacity of the furnace for transmitting air is immensely increased in this way, and the portion which passes, by means of the air-flues, through the fire itself is quite as effectually warmed as that which passes through the narrow space between the fire-dome and the casing.

A variation of this type is made by building up the fire-pot and dome of cast sections, which inclose between them, when put together, vertical air-flues, opening at top and bottom into the air-chamber, as in the case just described, and serving in the same way to add to the volume of air passing up outside the fire-dome a large additional quantity, passing through the fire-dome, in close contact with the fire. As the upward current through these strongly-heated flues is very rapid, the sides of them are formed with horizontal waves, or corrugations, so that the air will not only be held longer in contact with the hot iron, but will be thrown with a certain force against it, this being found to favor the heating effect.

A pattern of furnace somewhat similar in appearance to those with air-flues running through the fire-pot has a number of vertical smoke-flues carried down through the air-chamber, the smoke being drawn out from them either through an annular flue at the bottom, communicating with the smoke-pipe, or through a similar annular flue at the top. If such furnaces are well managed, and if the conditions are favorable, they are powerful heaters; but if the chimney draught is poor or the fire burns sluggishly or unevenly, the smoke and hot gases may find their way out through one or two of

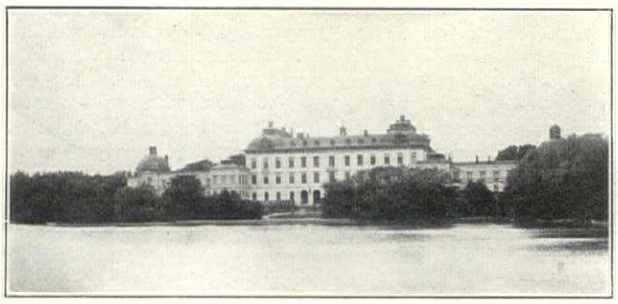
the flues, leaving the others cold, so that only the tin pipes from the side of the furnace over the active flues will supply warm air to their registers, the registers supplied from the other side of the furnace being cold.

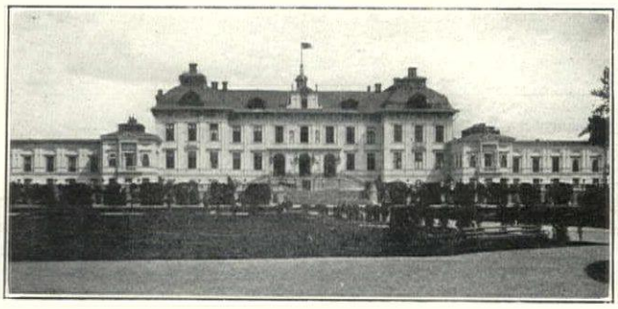
T. M. Clark.

(*To be continued.*)

SWEDEN—III.

THE seventeenth century inaugurated by Gustavus II. Adolphus is coincident with the Baroque. It was then that Sweden came into close contact with the rest of Europe. Her victorious generals returned from the wars in Germany anxious to emulate what they had seen of art and refinement in the Southland. Sweden owes much to Queen Christina in this one respect that she favored French and Italian art, and this was a factor in preventing Swedish building from sinking down to the level of the heavy and labored German Baroque. Between their many wars the powerful nobility became eagerly engrossed in the building of châteaux and manor-houses, embellishing them richly within and setting them off with parks and formal gardens.

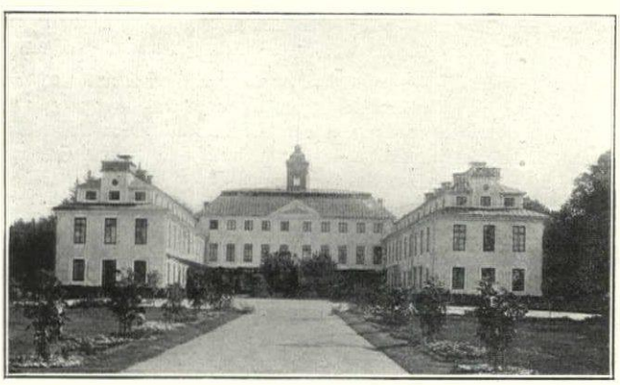




ROYAL CHÂTEAU OF DROTTNINGHOLM, SWEDEN. N. TESSIN, SR., ARCHITECT.

These structures are nearly always characterized by the simplicity of their mass and outline. The vagaries of the Baroque did not thrive. There is to-day a flavor of worthy dignity, and often of unassuming grandiosity, comparable with the best work of our own colonial period. The roof-lines are always conspicuous, and the gambrel form was much used for the smaller structure and treated in a rational manner. A gambrel story is better suited to a cold climate with its cool summers than it is to a scorching sun, for the rooms are too close to the roof. In fact, the gambrel roof was so much thought of that in some sections it marked the homes of nobility, none other being permitted to employ this style of roof. Tile was the universal roofing material.

A typical plan was soon evolved for the manor-house. It consisted of the "*corps de logis*," the main structure, approached through an imposing double or quadruple line of trees. On either side, but not connected with it, were lower buildings for the inspector and superintendent of the estate. These formed a court, open on one side, with a large circle for the driveway around a well-kept flower bed. On the other side of the main structure the flower-garden and park extended quite often down to the water's edge. In a way one is reminded of our Southern Colonial style of building, a main structure and low wings connected with the central part.



ROYAL CHÂTEAU NEAR STOCKHOLM.

The architect of this period is Nikodemus Tessin, the elder, who came to Sweden from North Germany. He is, however, nearly eclipsed by the brilliant performances of his son, the architect of the Royal Palace at Stockholm, but a glance at the photograph of the Palace Drottningholm shows that the elder architect was also a man of independent thought and vigorous mind. In this palace he has left a dignified monument, where the mass is most happily composed and, notably, the roof-lines are strong and graceful. The grand staircase is very successful and imposing. This Tessin has a long list of châteaux and manor-houses to his credit, in which he set a high mark for his gifted son. Of these only one other "Skoploster" is illustrated. It was he who introduced the domical church plan with a central arrangement. Up to his time the Gothic plan with classic motives had persisted. Builders found it difficult to break away from the long-aisled church plan.

The French architect de la Vallée and his son erected the simple and dignified Riddarhuset (House of Lords) as a monument to their taste. In this structure the small building to the left is balanced by a similar one to the right, a counterpart of the customary manor-house arrangement already referred to.

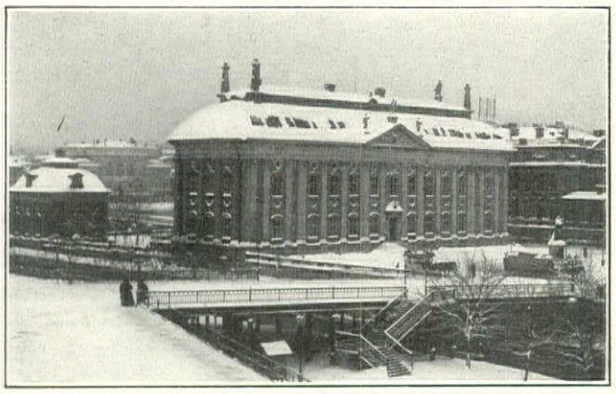
The greatest monument of this period is the Palace of Stockholm, which was begun quite near the end of the era of Sweden's political power, its construction being handicapped and seriously retarded by the subsequent period of depression and weakness. It is certainly a noble monument, with dignified lines. The setting is superb, on an island in Mälären, high enough to dominate. The low wings give it variety, without disturbing the balance or unity. From the day of its erection, down to our own time, it has been admired by native and traveler alike. Tessin was invited by three foreign kings to prepare plans for palaces. Added to his natural ability was his careful training, the very best that the country could give in his youth, supplemented by six years of study in Italy, two in France, and a special trip of thirteen months, preliminary to the building of the palace.

A TYPICAL COUNTRY-SEAT, SWEDEN.

To us of America, with our colonial Wren churches and spires, it is of special interest to see how a contemporary of Wren's tried to build a Gothic spire without Gothic motives. In the views of the Cathedral of Vesteras is seen a spire by this Tessin, a fine, bold composition in every way, very unlike the English architect's work, but, it may be added, far more suitable to the Romanesque Gothic church it surmounts than it would be possible to imagine a many-storied affair after Wren. There is not much to it, one might say—a truncated pyramid, elongated, a few bold mouldings at its base, and the four pedimented

clock-faces. Oh, yes, the four bull'seye-windows half way up, for without them the obelisk would look dull and meaningless.

Tessin was Swedish-born, the authorities to the contrary notwithstanding. His father came from Germany, his mother was a woman of the Swedish middle-class.



HOUSE OF LORDS (RIDDARHUSET), STOCKHOLM, LA VALLÉE ET FILS, ARCHITECTS, 1648-70.

It is only natural to find during the eighteenth century building almost at a standstill. There is but little to say of it more than that what was done, being mostly manor-houses, was done with good taste, being only superficially influenced by the frivolities of the Baroque and Rococo. Toward the close of the century Sweden entered its most brilliant literary and scientific period, which lasted far into the nineteenth century. But the arts were not cultivated with any great success. In this Sweden shared the fate of Europe, and of America, too, for that matter. Architecture, painting and sculpture were at the very nadir of depression and suppression. When the century had passed its fiftieth year, however, a change set in for the better. It was the artist and architect Prof. F. W. Scholander who represents the new movement. All this, however, belongs strictly to our own time. The

HISTORICAL MUSEUM, STOCKHOLM.

serious and high-class work done by the architects now in the prime of their productive power need not fear a comparison with the past on the one hand or the present on the other. The Swedish architects of to-day give their world-renowned brother artists, the Swedish painters and sculptors, a warm race in the struggle for permanent fame.

OLOF Z. CERVIN.

EXPLOSIVE VAPORS AND DUSTS.[1]

THE use of petrol or petroleum spirit in large quantities for oil motors and the necessity for storing it in bulk have of late given rise to a danger which before only existed to a limited extent.

Petrol is the first distillate from the crude oil as it comes from the oil well, and largely consists of pentane, $C_5 H_{12}$, and hexane, $C_6 H_{14}$, the first liquid members of the great paraffin group of hydrocarbons. This liquid is volatile even below the freezing point, and a pint of it poured on a level surface will cover about 80 square feet with an inflammable vapor, through which on coming in contact with a light a flame will spread. One pint of the liquid will also give enough vapor to render 100 cubic feet of air highly explosive.

These light oils have a wonderful penetrative power, and it is a matter of considerable difficulty to get vessels made for commercial purposes sufficiently vapor-tight to resist the insidious creeping of petroleum spirit. The result is that in stores, cellars, and other places where vessels containing such spirit are kept, slight leakage and evaporation into the air are constantly occurring, and as the evaporation of one volume of liquid petroleum spirit would render 5,000 volumes of air strongly explosive, it is clear that special precautions must be taken in dealing with the storage and use of such spirit.

The temperature needed for the ignition of explosive mixtures of petroleum vapor and air is comparatively high, and experiments made by Colonel Majendie, Sir Boverton Redwood, and Dr. Dupré showed that such mixtures were not ignited by the glowing spark on a splint of wood, a red-hot coal which had ceased to flame, or a shower of sparks from a flint and steel, and that it needed a temperature of platinum wire raised nearly to a white heat before explosion took place, that is, about 1,400° C.

One of the greatest dangers with the vapor of volatile hydrocarbons is that the great weight of the vapor as compared with air will cause it to creep along surfaces for very long distances, and then on reaching a light the flame flashes back along the vapor to the source from which it sprang.

It may be accepted that the transport and storage of refined lamp oils and residuum are practically free from danger, the only point to be guarded against being the ignition of the liquids in volume during fires, while the real dangers to be guarded against are to be found in the transport and storage of crude oils containing highly volatile constituents, and petroleum spirit.

In all confined spaces used for the storage of such material, the adoption of the safety-lamp, and the constant testing of the atmosphere by the beautiful method devised by Dr. Clowes and Sir Boverton Redwood would go far towards insuring safety. . . .

When it became clearly evident that the development of the carriage of crude petroleum in bulk, and the carriage and storage of petroleum spirit necessitated analysing the atmosphere in tanks and stores, this method of testing naturally suggested itself, and Sir Boverton Redwood succeeded in devising a special modification of the lamp, and also an apparatus for collecting samples of the atmosphere in which petroleum vapor was suspected, and testing them under uniform conditions.

The apparatus consists of the lamp, the cylinder of compressed hydrogen, and a sampling vessel. The base of the lamp is fitted with two inlet-tubes, one for the sample of atmosphere, and the other for the hydrogen, the latter being provided with regulating tap and jet. Immediately above the tube for the inlet of the vapor-laden sample is a series of baffles, on the top of which are three discs of very fine wire gauze, which regulate the flow of gas and prevent any flashing back of the flame into the sampling vessel. The hydrogen jet is partially inclosed by a metal tube, the front of which is removed, and over this slides a chimney partly of metal and partly of glass, the metallic portion being blackened inside. In the window are lines corresponding to various heights of flame-caps.

The collecting vessel consists of a compression pump fitted with a metallic piston fixed inside a strong metal cylinder, which is furnished with a pressure-gauge and valve, and also has connections and taps for collecting and delivering the sample. About thirty strokes of the pump suffice to charge the cylinder to a pressure of 30 lbs. to the square inch, when it will contain one-third of a cubic foot of the atmosphere sampled.

In using the apparatus the hydrogen cylinder is connected to the lamp, and, the sliding chimney being raised, the hydrogen is turned on and lighted. The supply is adjusted to give a flame of slightly more than 10 millimetres in length, and the apparatus is left for a few minutes to warm up so as to drive off any condensed moisture from the surface of the chimney. The collecting vessel is attached to the other inlet of the lamp, the chimney is closed completely, and the hydrogen flame finely adjusted by the regulating valve till the tip of the flame is just hidden when the eye of the operator is on a level with the bottom of the window.

[1] Extracts from a lecture by V. B. Lewis, Professor at the Royal Naval College, Greenwich, before the Society of Arts.

The lamp and head of the operator are then covered with a light-tight cloth, and the tap of the collecting cylinder turned on. Even with a proportion of vapor that is too small to give an explosive atmosphere, a cap of a greyish-blue appears on the flame. As the proportion of vapor increases, the flame-cap becomes better defined, followed by considerable enlargement of the cap, this feature occurring before the atmosphere contains sufficient vapor to render it inflammable.

When petroleum spirit has once taken fire it is most difficult to deal with, as, being far lighter than water, even when great volumes are poured upon the fire, the spirit rises to the surface and continues burning, while the vapor given off prevents any cooling of the liquid from proving efficacious. Chemical extincteurs and gases like carbon dioxide and sulphur dioxide can only act upon it if the fire be in a very confined space, as the updraught caused by the fierce flame sweeps them away and sucks in air to the burning mass. Sand or fine mould is the best thing for extinguishing a petrol fire, and if this is not at hand in sufficient quantity the next best thing is to let the fire burn itself out, and devote one's whole attention to protecting surrounding property.

The formation of any large quantity of organic dust floating in the air is a very distinct danger, as not only is dust liable to become pyrophoric in its nature when lightly charred on hot-water pipes or heating apparatus, but when suspended in quantity in air gives an explosive atmosphere through which a flame will flash from an exposed light for great distances. Fires frequently occur in flour-mills and other places where finely divided combustible material is liable to become mixed with the air.

All finely divided particles have the power of occluding or taking up oxygen from the air, and with many forms of combustible dust this has been found to take place to such an extent that a flame will flash through it even when the dust is suspended in an atmosphere that would not support ordinary combustion. It can also be proved that if a trace of an inflammable gas be present in air, although the quantity may be so small as to be far below the explosive point, a small quantity of dust suspended in the air will make it at once violently explosive. This is a very great danger in coal mines, where a small trace of fire-damp may be made actively dangerous by a quantity of dust raised during blasting operations, while an escape of gas in a flour-mill which might be so small as not to be detected by the nose, would make an atmosphere containing flour-dust actively explosive.

Another very dangerous form of material for storage is collodion, which during the past few years has been extensively used for the manufacture of imitation amber, tortoise-shell, ivory, and even artificial silk. . . .

The danger of collodion goods is the low point at which they ignite and burn with great fierceness, the ignition point sometimes being as low as 150° C. (302° F.), and rarely exceeding 200° C. (392° F.). When the collodion was used for making a fabric for dresses, such as artificial silk, the danger became so grave that for this purpose at any rate after manufacture, the collodion had to be denitrated by treatment with some body like ammonium sulphide, which reconverted the explosive nitrocellulose back into the harmless cellulose.

The collodion cotton prepared for making the solutions and emulsions employed in these manufactures owes its great danger to the fact that the cotton fibres consist of minute tubes, which retain with great pertinacity traces of the acids used in the nitration, and unless this acid be entirely eliminated, the nitro-cotton during storage undergoes decompositions, which soon emit sufficient heat to reach its low ignition point.

In the mixed storage of various substances many unexpected dangers arise, especially if there be present among the materials oxidizing agents, that is, bodies rich in loosely-held oxygen, and a very considerable amount of chemical knowledge is necessary to gauge whether or no danger arises from the simplest bodies, as, should fracture of a bottle or package arise and bring about a mixture, unexpected phenomena are developed. For example, it is not unusual to find in a dry-goods store packages containing crystals of potassium permanganate, which, dissolved in water, give a very valuable disinfecting liquid—Condy's fluid; while glycerine, so frequently used for chapped hands and as an emollient for the skin, would not be a substance which to an ordinary man would suggest any degree of danger, but, should a bottle of glycerine upon the shelf of a store be cracked, or some of the glycerine be spilt during transfer to another vessel, and drip on a cask or package containing potassium permanganate, excessively fierce combustion would be at once created, while even water itself coming in contact with such substances as potassium or sodium gives rise to violent combustion.

RESISTANCE OF BUILDING STONES TO FROST.

ATMOSPHERIC variations exercise so prejudicial an effect upon certain building-stones that the opening of a new quarry is a matter of considerable importance, for architects and engineers do not adopt materials from fresh sources without being fully satisfied as to their reliability. The prudence of this course is further justified by the fact that cases have occurred where builders have been compelled to suspend operations because they have been insufficiently informed as to the resistance to frost of the stone employed. Therefore, it must be agreed that the resistance of structural materials to frost is a question of primary importance.

During a long period the Brard process was the only means by which account could be taken of the characteristic of stone to which attention is here directed. Although not enabling the problem to be solved in a direct and absolute manner, it furnished approximate results that were formerly accepted as sufficiently satisfactory.

This process was conducted by immersing a fragment of stone with sharp edges, or preferably a cube measuring a few centimetres across, in a cold saturated solution of sodium sulphate. The solution was then boiled for thirty minutes, after which the stone was removed and exposed for eight to ten days in a chamber, where a moderate and constant temperature was maintained. At the end of this period the specimen was examined. If it remained intact, its resistance to frost was considered to be satisfactory. On the other hand, if the edges had lost their sharpness, showing splinters that appeared to be on the point of separation and that could be carried away by a jet of water from a wash-bottle, it was regarded as liable to injury by frost.

Some modifications were made in this mode of operation by MM. Vicat, Héricart de Thury, and Husson, who attempted to render the details of execution more methodical. These scientists recommended that observations should be made at the end of pre-determined periods, and that the particles carried away by washing after each period should be weighed for purposes of comparison.

In spite of these modifications the process still presented the grave defect of indicating materials as liable to injury by frost which were not so affected, the fact being that much of the deterioration observed was caused by unduly protracted treatment.

M. Braun then attacked the problem in a different manner. He proposed to characterize as liable to injury by frost all stones whose resistance to tension is less than the expansive force of water at the moment of congelation. This idea was certainly rational, since it is precisely the increased volume of water in passing from the liquid to the solid state that causes the disintegration of stone under the influence of frost. But the absence of exact experimental methods and the inadequacy of the results obtained caused M. Braun to abandon his process.

In the present day the resistance of stone to frost is determined by laboratory tests based upon successive and rapid variations of temperature.

The specimen of stone selected for examination is cut in the form of a 7-centimetre cube, which is submerged in a vessel containing water. The vessel is placed under the receiver of an air-pump, air being exhausted until a partial vacuum of 10 in. is obtained. The quantity of water absorbed is naturally governed by the porosity of the material. If the stone is not to be employed under water it is sufficient to accept the natural absorption of the cube after immersion in water for twenty-four hours. After saturation the cube is introduced into an apparatus containing a freezing mixture capable of maintaining during several hours the temperature of from —20 deg. to —15 deg. C. After being exposed for four hours to the temperature of, say —15 deg. C. the cube is removed from the apparatus and immersed in distilled water, or, in default, in drinking water, of which the temperature is +15 deg. C. The specimen is then examined. In cases where distilled water is employed for washing, the water is collected and examined for soluble salts.

Sometimes the tests are completed by determining the compressive strength of the stone under examination, the specimens being dried after twenty-five successive freezings and thawings, and by comparison of the resistance with that of the original stone tested in the dry state and after the absorption of water to the point of saturation.—*Prof. J. Malette in "The Builder."*

ILLUSTRATIONS

ROOD AND CHAPEL SCREENS: PLATES 34-41.

THE details of the screens at Fécamp—illustrated in the last number of "Rood Screens"—preserved more of the Gothic character in the detail of their composition than any of the screens of the Early Renaissance save, perhaps, the choir screen at Vendôme.

Here at Vendôme the carved pinnacles and gables ornamenting the choir screen give us an idea of the now destroyed terminals of the Fécamp examples. Pinnacles and gables and flying-buttresses, Gothic in form and detail, are combined with Renaissance balusters and colonnettes in so complex a manner it would require the most vivid imagination to restore the upper part of the Fécamp screens from the small traces left us.

As a composition the Vendôme example is not successful, the horizontal cornices dividing the height into equal parts. On the sides, however, this is not so strongly felt and the upper division is treated with Flamboyant tracery intersecting the colonnade treatment. The purist has strong grounds for condemning the work of the early Renaissance with its mixture of styles, but there is a romantic quality in every example which fascinates one.

This attraction is strongly felt on the Rood-loft at Limoges. It originally divided the choir and nave, but was removed and rebuilt in front of a side bay. The composition is Gothic, but only on the remains of the groins can the Gothic core be detected. Every member is covered with a Renaissance veil that is almost transparent one might say. Canopies, drops, corbels, all Gothic in composition, are ornamented with Renaissance columns, pilasters, niches, keys, consoles. Incredible skill in execution is found in every part. The minute free-standing columns in some places are scarcely thicker than a lead pencil. A study of the balustrade here illustrated, which is not over three feet high, will give one an idea of the minute scale of the ornament. An excellent cast of this screen has been set up in the Trocadéro Museum in Paris.

At Rodez a more sedate composition has been attempted and richness of effect tried for in a multiplicity of detail covering every part. The penetrated stonework in the opening and in the tympanum over the door is worthy of study and possesses a crispness and freshness seldom seen outside of Gothic work.

The irregular shape of the arches over the door and window seems to indicate the designer could not force himself far from the Gothic pointed arch. A cast of this screen also is in the Trocadéro, and from this our illustrations have been taken.

W. T. P.

PRIEST'S HOUSE, ST. JAMES'S PARISH, JAY STREET, BROOKLYN, N. Y.
MR. GEORGE H. STREETON, ARCHITECT, NEW YORK, N. Y.

PROVIDENCE HOSPITAL, SECOND AND D STREETS, S. E., WASHINGTON, D. C. MESSRS. WOOD, DONN & DEMING, ARCHITECTS, WASHINGTON, D. C.

REAR VIEW OF THE SAME.

TOWER OF THE SAME.

Additional Illustrations in the International Edition.

MAIN ENTRANCE FEATURE: PRIEST'S HOUSE, ST. JAMES'S PARISH, BROOKLYN, N. Y. MR. GEORGE H. STREETON, ARCHITECT, NEW YORK, N. Y.

NOTES AND CLIPPINGS

THE RESTORATION OF PETERBOROUGH CATHEDRAL.—The restoration of the north transept of Peterborough Cathedral was begun a few weeks ago. With this undertaking the work of restoration commenced in the "80's" will have been completed. During the last twenty-five years between £80,000 and £100,000 have been spent on the restoration of the cathedral. The architect is Mr. G. F. Bodley, R.A. The north wall leans a good deal, but Mr. Bodley thinks the settlement took place a considerable time ago, and that the masonry has now got its bearing. The cracks and displacement require to be carefully treated. Mr. Bodley says:—"The building must obviously be accepted as an ancient one, and all the old work that it is possible to retain should be retained. But all that adds to the durability of the fabric and to its greater preservation should be certainly carried out as soon as is possible, and any glaring defect should be made good."—*The Building News.*

FILTRATION AT WASHINGTON A FAILURE.—The citizens of the District of Columbia are ordered to boil their drinking water. Considering that only about a year ago the installation of a filtration plant was completed at a cost to the National Government of more than seven million dollars, the order is surprising and its explanation is calculated to disturb the people in communities where filter-beds are depended upon for a pure supply. Malarial and typhoid fever have long been prevalent among the users of Potomac river water, and, contrary to all reasonable expectations, one of the most perfect filtration plants in the world is now found to be inefficient to remove the germs completely. Though it otherwise cleanses and clarifies the water of its more obvious offenses, it is frankly conceded that the plant is a failure for the accomplishment of its chief purpose. Probably, or at least it may be hoped, the conditions were initially of a kind less susceptible to improvement than those existing at the source of the water-supply of cities like Providence, for instance, where much consideration was given to the selection of a filter system before the adoption of the sand beds. Nevertheless, in the course of the controversy that always develops whenever a community takes up the subject, the advocates of mechanical or chemical filtration will hardly neglect the extraordinary opportunity to support their claims afforded by the experience in the practical service of the model installation provided for the city of Washington.—*New York Evening Post.*

FIRE-KILLED TIMBER.—Although it has been known for a number of years that fire-killed timber has a considerable value in railroad and mining operations in Colorado, it has been brought out only recently, says *Wood Craft*, that a wide number of uses are open for this timber, and that in certain respects it has actual advantages over green wood. These facts are deduced from a study of conditions on the Pikes Peak Forest Reserve, where the ravages of fire have been particularly widespread and destructive. In many instances the burned timber is the only kind available at a particular point. So for timbers and ties, in mines and railings, the dead material has been used for many years. The species used are red fir, yellow pine, lodgepole pine, limber pine, range pine, pinion, Engelmann spruce, and blue spruce. Of these the pines, red fir, and Engelmann spruce furnish the bulk of the material. Time elapsed since burning seems to make no great difference in the value of the wood. The timber used has been burned all the way from three to fifty-five years. The amount of this timber which has been used is very considerable. There has been one sale from the reserve for box boards and one for telephone poles; but the three main uses continue to be for mine timbers, railroad ties, and firewood. Red fir is preferred for railroad ties, then yellow pine, limber pine, and range pine. White pine has been objected to because of its lack of durability; but it is now taken in many places. At Rosemont, Col., burned timber of all kinds is made into ties, some of the material having been burned fifty years ago. It is asserted that dry ties last as long as green ties, and in many cases longer. Dry ties hold a spike well, and a tie plate does not cut into the wood so seriously as it does in the case of a green tie. Engelmann spruce is as good as the other species, as far as mechanical wear is concerned; but it decays much quicker, and so should be given a preservative treatment. Burned timber was first used for boxes by the Denver Crate and Box Company in February, 1903, the species used being Engelmann spruce and lodgepole pine, with some red fir and limber pine. The material used had been burned from one and one-half to four years. The Engelmann spruce was excellent, and the lodgepole pine also gave good results. The fire seasoning had driven the odor out of the pine, so that it could be used for packing accounts; also on account of the perfect seasoning the boxes remained tight when put up, and therefore sold better than green boxes. For mine timbers all species are used, if of the requisite size. Dry timber is preferred because of its lightness, durability, and stiffness, all principally due to its better seasoning. For many purposes fire-killed timber should be preferred to green timber, because it is so well seasoned. This seasoning makes it more durable than green timber, and also makes it lighter, so that its cost of transportation is appreciably less, and it is therefore available, not only for numerous local uses, but for shipping long distances.

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THE tidy man does not wilfully smirch his own face, albeit that can be so easily cleansed and, by the same token, the really astute man does not, unless for great worldly profit, besmirch his own reputation, a thing which rarely can be restored to satisfactory condition. As it seems evident that a good many reputations are going to be sullied during the investigations into the scandal caused by the building of the Capitol at Harrisburg, it is evident that their owners must be content hereafter to be classed otherwhere than amongst the astute. Probably the whole truth will never be made public; those who have engineered the matter thus far know too many ways of smothering an investigation and calling off the investigators before the danger-point is reached. There is no very good reason why so wealthy a State as Pennsylvania should not have a thirteen-million or a thirty-million dollar capitol, if the people so decide, but there is every reason why a four-million dollar building should not be expanded by chicanery into one costing thirteen million dollars. It appears that the Building Commission seeks to justify this unexpected expenditure of an excess of nine million dollars by pointing out that the bill appropriating four million dollars for the building of a complete and fireproof State-house contained an inconspicuous clause giving it the right to expend for "furnishing" the building any money in the State treasury not called for by special appropriations. If an honest accountant can make plain that some or all of the money used—or supposed to be used—on the building was, when used, actually called for by other appropriations, it would seem as if the Building Commission were within easy traveling distance of the penitentiary.

FURNISHING is a matter that architects usually feel they know something about, seeing that they are entitled to charge a higher rate of commission on work that falls in that category, and so they will be interested to know how the Building Commission have expended nine million dollars in this class of work under the protection of the clause in the appropriation-bill referred to above. In running over the itemized statement issued by the Building Commission—the one the State Treasurer refused to sign—we find that payment has been authorized for these curious "furnishings" amongst others no less curious: For wooden wainscoting, mantels, etc., $889,940; for marble wainscoting, mantels and bases, $278,109.47; for flues, fireplaces, etc., $21,237.59; for parquetry flooring, $142,412.47; for vaults and safes, $66,000; for thermostats and valves, $59,408; for additions to electric lighting, $71,833; for cement flooring, $25,117.77; for constructing "the eighth floor," $303,693.14, and so on. Evidently in the lexicon in use at Harrisburg some strange things are included in the definition of "furnishing." There seems to be one redeeming point in this statement, the architect seems not to have computed his commission on these nine millions at the ten per cent. rate usually allowed for furnishings, but appears to have been content with a more modest rate. It is conceded, we believe, that on the cost of the *real* Capitol ($3,600,000) he was paid $180,000. The Building Commission's statement shows that for his skill and labor in helping to furnish the Capitol he had built complete and fireproof, he had been paid $235,000, and it is acknowledged that there is still due him the sum of $104,585.42. His commission appears, then, to have been four per cent. on the outlay, not an unreasonable compensation, but still as a total making a much larger sum than the architects of Pennsylvania realized they were turning their backs upon when they yielded to the urgings of the Philadelphia Chapter A. I. A., and unwittingly made themselves parties to a conspiracy against the State.

IN this devious way the State of Pennsylvania has secured a State-house of the standard type whose commonplaceness architecturally it is hoped will be lost sight of in the glamour that is to be thrown over it by the decorators who are expected to do for it what they did for the Library of Congress at Washington. Apparently Mr. Edwin A. Abbey has a contract for the "mural art painting" in the sum of $222,887.50, and though we do not know how much work is actually covered by the contract, we hope he may fill it with a greater sense of commercial satisfaction than seems likely to fall to the share of his unfortunate fellow-artist who so ill-advisedly entered into a similar contract to provide the sculpture. Amongst other things that Mr. George Gray Barnard has undertaken to provide for the building are thirty-two figures and groups, to which his ambition, or his perception of artistic requirements, has led him to give colossal size. As it was hoped to have all or most of these figures in place at the time of the dedication, and as none of them, we believe, was ready, the architect and Building Commission naturally were much disappointed and so instructed

Entered at the Post-Office at New York as second-class matter.

the sculptor to prepare plaster models of enough of the figures to answer the purposes of the late ceremonial. Learning that this could not be accomplished in time, the order was cancelled, and now it is said payment for this extra work is refused! This is indeed adding insult to injury, for the unfortunate sculptor already realizes that the one hundred thousand dollars, the sum at which he accepted the job, is a very inadequate price for thirty-two colossal figures, particularly as the seventy-five thousand dollars already paid on account are nearly expended and the balance cannot be availed of until the statues are delivered. Mr. Barnard's predicament adds one more disagreeable feature to the general story.

PAINTERS are notoriously incapable as business men, while sculptors usually show some of the business sagacity which marks the third number of the trinity of art, the architect. Whether it is because of this community in business sense, or whether it is because architects have always given more attention to form than to color, the fact is that architects have as a rule a better understanding of and sympathy for sculpture than for painting, and one would think, because of this, that it would be more common for an architect seeking distinction to turn to modeling, rather than to easel-work, but we believe the reverse is the case. This makes the course of Mr. Lawrence Harvey, a well-known English architect and writer, all the more notable. "Having no more any reason for earning money [happy man!], I have abandoned the practice of architecture," writes Mr. Harvey, "and taken to sculpture," and then gives some excellent reasons for taking the step. Amongst other things, he says that "architecture involves the practitioner in commercial transactions which are not always pleasant and offer sometimes danger to one's purse." But if he will consider Mr. Barnard's case, and some others we could cite, he would discover that even the sculptor's lot may have its dangers for the purse. His recommendation that other architects desiring to retire but unwilling to be idle should follow his example is worth considering, for, if acted on, it might provide a class of sculptors who really understood what sculpture should be when associated with buildings, something better, that is, than the stereotyped forms of the old school architecture stone-carver, something other than the pictorial and anecdotal figures that most of the sculptors of to-day are giving us in their place.

NOW that Monsieur L. M. Cordonnier has by the grace of Queen Wilhelmina—though what she has to do with the matter, we do not clearly understand—been appointed to carry out his design for the Peace Palace, we suppose that noted competition must be removed from the list of failures and included amongst the successes. Two matters, however, properly affect this reclassification: in the first place, the architect has been notified that he must make some modifications in his design in the interest of economy, and in the second place it remains to be proved whether, even then, Mr. Carnegie may not have to be asked to add a considerable sum to the building fund. Mr. Cordonnier's design, interesting as it was, obviously could not have been built within the appropriation, and it seems hardly proper to call a competition a success when the award is made to one who has shown sovereign disregard for a prime condition.

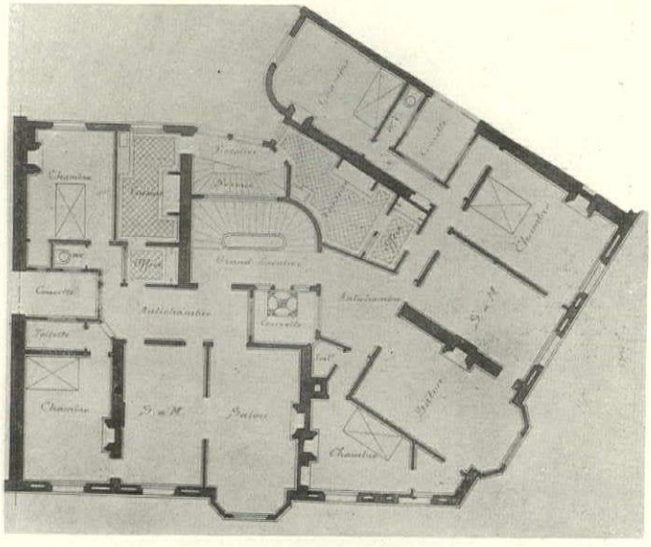
MR. HARRY HEMS, the well-known English architectural sculptor, is quite right when he writes that there is one thing that Americans "distinctly lack, and that is—good manners," and good manners in a direction where we should be peculiarly keen to show them, seeing that the balance of the account against us is so very long. The particular incident that calls out this stricture was the summary exclusion from the works going on at Morningside Heights, New York, where the Cathedral of St. John the Divine is being built, of an English architect of name and note, traveling in this country, who naturally visited the building, sketch-book in hand, and as naturally expected to receive the same decent treatment that he would receive at home or on the Continent under similar circumstances. But no, in spite of explanations and the production of papers showing who he was and why he was there, he was told not to stand on the order of his going but to go at once. We venture to suggest to the architects of this particular building that they at once bring about a reform in this particular, as the Cathedral is peculiarly likely to be visited by foreign architects, and the courtesies these may receive there will do something to balance the many acts of gracious kindness that have been shown in years passed to American students traveling in Europe.

SOMEONE sends us a copy of the report on the recent competition for a high-school building at Cincinnati, O., adding a note that it is sent "apropos of our recent editorials on competition." As underscoring draws attention to the fact that the successful architect is to be paid only two per cent. on the cost, we imagine that this is the point where some of our comments are supposed by our correspondent to be confirmed or refuted. Now, while it is regrettable that a city of Cincinnati's size puts so low a value upon architects' services as this implies, it is evidently a situation that must be accepted, and while we believe it right and proper that architects should combine in the attempt to bring about a better treatment by force of argument, we do not believe they have any right by combination and agreement to deprive their city of competent architectural service, if competent architects are willing to render it for the money the city is willing to pay. We believe the children of Cincinnati, where school architects are paid two per cent., are as deserving of well-built and planned school-houses as the children of Boston, where architects are paid five per cent., and we feel that architects who continue to prevent the children of their fellow-citizens from having proper school-houses come dangerously near to engaging in a criminal conspiracy. *Salus parvulorum suprema est lex.*

TERRA-COTTA ARCHITECTURE IN PARIS.

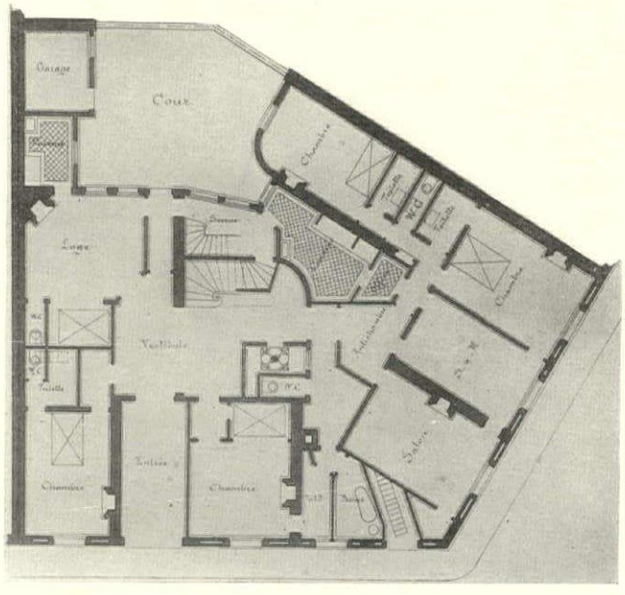
HOUSE ON THE RUE CLAUDE CHAHU.

ONE thing that impresses the American in Paris is perhaps the enormous number of buildngs here of all kinds, built of stone, and not only that, but of stone often most lavishly carved. With a natural material like this limestone, which, varying in tone or fineness of texture, seems to be found in abundance in nearly every part of France, a stone which lends itself most readily to carving on account of the almost incredible ease with which it can be worked, little wonder is it that brick and terra-cotta are used comparatively seldom. Nevertheless, realizing, as we do, the constant striving of the French to free themselves from precedent, we must be prepared to find them doing something new in terra-cotta.



FIRST-STORY PLAN.

It is for this reason that I have chosen an apartment-house by M. Charles Klein, architect, as illustrative of one of the phases of this development. Built only three or four years ago, under conditions which allowed a perfect coöperation between the architect and his terra-cotta manufacturer, L. M. Muller, as they strove together to derive the utmost possible from a comparatively unaccustomed material, the house now stands a deserving subject of study.



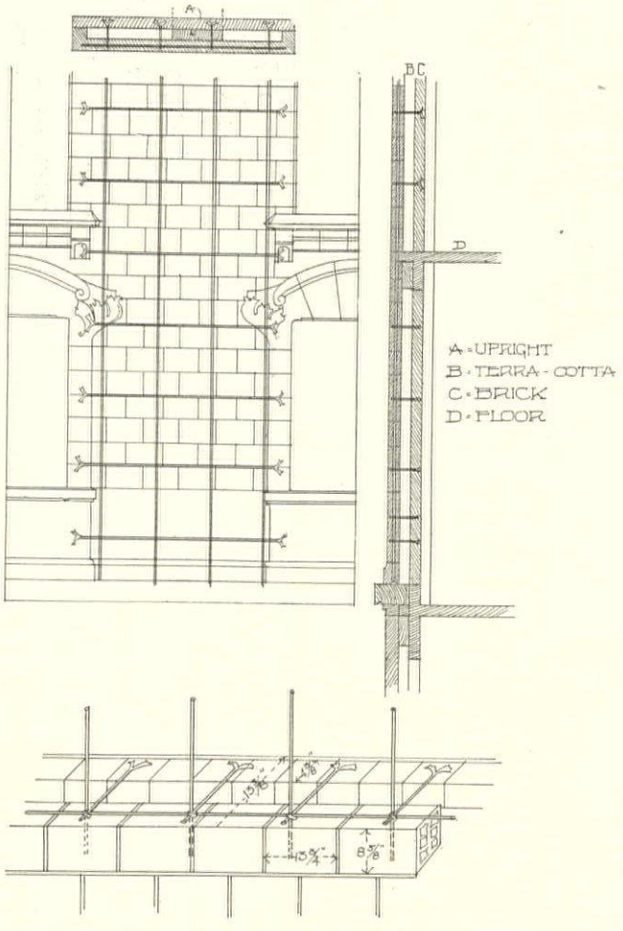
GROUND-FLOOR PLAN.

Situated on a narrow side street in Passy, near the Trocadéro, in a district given over largely to apartments, mostly modern, it unfortunately would never be seen unless one set out with the express intention of finding it. The address is 9 Rue Claude Chahu, a short street leading off to the right from the Rue de Passy, halfway between the Trocadéro and "La Muette." As is to be seen from the illustrations, it is an apartment-house, the lower floor of which contains one suite and several odd rooms, while each of the upper floors contains two suites.

The arrangement of the rooms is such as to take good advantage of a peculiarly shaped lot, and while the suites may lack bath-rooms and closets, and while it may be necessary to cross the hall to go from the kitchen to the dining-room—the latter being marked "S. à M." on the plans—we must remember that the traditions of planning here do not necessarily agree with ours.

Except for an interesting iron stair-rail similar in character to the iron entrance-gate, the interior is of the simplest. The architect realized that there would not be one tenant in a hundred who would have the taste or the money necessary to furnish his suite in harmony with the style of decoration developed on the exterior, and therefore the interior is finished in plain oak and ash, without mouldings. The vestibule is an interesting study in terra-cotta, the walls being lined with a greenish-blue glazed tile, over which runs a vine pattern; the end wall is of a bronze color, while the arched ceiling is of a light, unglazed buff tile. The floor is of marble mosaic.

The real interest of the building, however, lies in the façade. We can see from the accompanying sketch the peculiarity of its construction.



DETAIL OF CONSTRUCTION.

The actual frame is entirely in armored cement, after the Hennebique system, a system used here almost to the exclusion of all others. The uprights are six to eight inches square, the floors have a uniform thickness of four and three-quarters inches, without beams, unbroken except for chimney-flues. Further, the floors continue through the outside walls at the third and sixth floor levels, and on all the other floors at the window openings, with the result that there is absolutely no chance for fire to pass from one floor to another except by the stair-hall. Yet there the stairs are of concrete and the rail of iron.

The outside wall is in two distinct parts, separated by an air-space of 4½ inches and bonded together only by the floors and the iron anchors, which are 16 inches on centers horizontally and 26 inches on centers vertically. This air-space prevents the ingress of moisture sufficiently to allow the walls to be plastered directly on the inner surface. This latter is of ordinary red brick, one course thick,—that is, 4 3-8 inches. The stock bricks here are

2 3-16 x 4 3-8 x 8 5-8 inches. The outside wall is built up of blocks of terra-cotta 13 3-4 inches long, 8 5-8 inches high and 4 3-8 inches deep. These blocks are threaded together by a network of circular iron bars 5-16 of an inch in diameter, 16 inches apart horizontally and 26 inches apart vertically, anchored to the back wall at every crossing. These crossings are bound with iron wire. Either end of each bar is anchored in the terra-cotta. The iron bars once placed, all the voids in the terra-cotta are tightly packed with cement mortar. This system was invented by M. Cottancin and

ENTRANCE GATE.

was first used by A. Bigot in a house built by M. Lavirotte on the Square Rapp. It was much modified and improved in the present house of M. Klein's.

I regret that photographs are unable to give any good idea of the color-scheme of the exterior, for it depends fully as much on its color as on its design for effect. The base course, up to the level of the first-floor windows, is of cement, natural color, except for the two plinth-blocks at the main door. These are in a limestone which strongly resembles Milford pink granite. The wall-surface of the first and second floors is of unglazed, hard-baked terra-cotta, of a tone varying from olive-yellow to a russet-brown. The sunken line, a quarter of an inch back from the edge of the block, is a deep brown in tone. The base-course of the third floor is a brick-red. The wall of the third, fourth and fifth floors is of a buff terra-cotta, with the blocks all carefully assorted so as to have the darkest ones at the bottom. The wall at the sixth floor is of brick, the same color as the terra-cotta below.

The mortar throughout is a warm gray-brown.

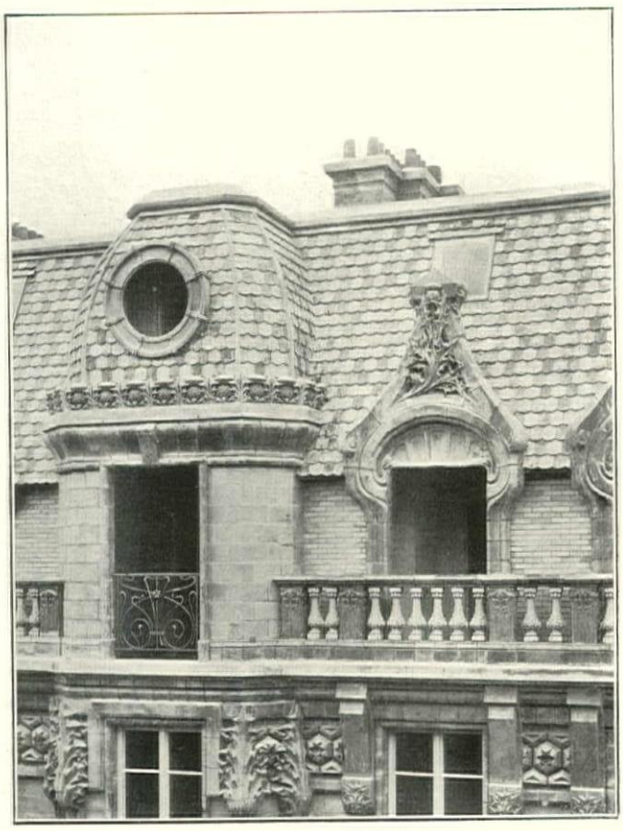
The roof, where visible from the street, is also covered with terra-cotta tiles similar in color to the ornament below.

The thistle-leaves have a constantly varying play of color, running from a robin's-egg blue through olive-green and old-gold to a russet-brown. The blossoms are of a deep red, as are the centers of the frieze motive under the sixth floor balcony. The rest of this balcony and frieze are of the color of the wall below, as are also the window architraves of the three upper floors. Those of the three lower floors have the same greenish color as the thistle leaves, with the same play of color, depending on the glaze. The balconies, brackets, and other ornaments are of the same buff-brown color as the plain wall-surface.

The main door is of greenish terra-cotta, like the rest of the ornament, with the unornamented band of a deep yellow-ochre tone. At the right we find a handsomely wrought bronze push-button inset in a reddish marble slab.

Since taking the photographs, the roofs of the two bow-windows have been completed by surmounting each with a large pine-cone of greenish terra-cotta on a pedestal of buff terra-cotta. On account of its glaze and firing, the greenish terra-cotta wherever used becomes practically faïence; a happy contrast with the dull surface of the rest.

Many single pieces are fairly large in size. The balusters are each in a single piece. The largest single pieces are the short columns under the brackets which support the two bow-windows. These are about four feet long.



ROOF TREATMENT.

The main gates are of wrought-iron, painted black, surrounded by a climbing motive in beaten iron, bronzed. The window railings are all in wrought-iron, painted black.

The exposed woodwork of the windows is all painted buff in color, to harmonize with the terra-cotta.

The whole building declares a conscientious attempt to use terra-cotta to good advantage along new lines. As to whether it is a success or not, as to whether the material is frankly expressed or not; that each will decide for himself.

The architect freely admits that the façade might be made in an excellent quality limestone, preserving everywhere the same details, for about a third to a half the cost of the façade as it was actually built. A large part of this extra cost is due, however, to the experimental character of the work. In any case it gives an idea of one phase of the new work here in burned clay.

GEORGE B. FORD.

HEATING APPARATUS.—II.

NEARLY all modern furnaces may be classed under one of the types described above. A few still in use and having the advantage of simplicity increase their capacity for transmitting air by forming the fire-pot and dome with "gills," or thin vertical projections, or occasionally with projecting points instead of gills, the object in either case being to interpose in the current of air hot surfaces, which may warm without obstructing it. If not carried too far, this system is a good one, and has long been popular in England, where a "gill-stove," consisting of an ordinary stove armed all over the outside with vertical ribs, is still looked upon as the highest flight of heating science; but as applied to furnaces, the gills, although they enable a small fire to heat an extended surface of iron, also enable a current of cold air in contact with them to exert a powerful action in chilling the fire by which they are heated, so that it is

best, except in small apparatus, to have all the heating surfaces, however they may be waved or corrugated, exposed on the inside directly to the fire.

Another exception to the current forms of furnace is to be found in the soapstone or fire-clay furnaces which were once popular and have special merits. Although expensive in first cost and wasteful of fuel, the mass of stone or fire-clay seeming to absorb in some unaccountable way the heat from the fuel, they give a peculiarly soft, pleasant heat and are very steady in operation, being but little affected by cold winds or variations in exterior temperature, while if properly designed and built they are proof against leakage of gas and are practically everlasting.

Among the different types of apparatus thus briefly described, the architect, when his client has decided upon furnace heating, must choose according to his best judgment. If the house to be heated is a small one, requiring only three or four registers, the simplest sort of wrought-iron furnace, provided it is well and strongly made, is likely to be the most satisfactory. Such a furnace, consisting simply of a wrought-iron dome, set upon a cast-iron, fire-brick-lined fire-pot, requires very little cleaning in spring, having no complicated surfaces to collect soot, and is, or should be, very durable. It is true that it will deliver only a small quantity of air, but this air is easily heated to a high temperature, so that it can be conducted to a distance with little difficulty and is efficient in warming the rooms in which the registers are placed.

All these advantages are lost, if the attempt is made to heat with such a furnace a number of rooms greater than that for which it is adapted. The writer once spent a winter in a house which had twenty-one registers connected with a simple wrought-iron furnace, with only capacity enough for supplying four or five efficiently. If four-fifths of the hot-air pipes had been left out, the house, which was not a very large one, could probably have been satisfactorily heated by concentrating the power of the furnace on the remainder, keeping the hall warm and having the bedroom doors open; but, with twenty-one tin pipes dividing among them a supply of hot air barely sufficient for five, the effect was that the house was almost uninhabitable, one room, in which an open coal fire supplemented the register, being the only comfortable place in the house, outside of the kitchen.

It is possible that this failure, for it was nothing less, should be laid to the account of the distinguished architect who designed the house; but the local tin-man, who apparently knew, and cared, even less than the architect about house heating, but who could see a profit in furnishing pipes and registers to supply hot air to the kitchen and other rooms as little in need of it, may very likely have contributed by his "advice" to the result; and the architect who desires to satisfy his clients in such an important matter as the heating of their houses will do well not only to make himself familiar with the qualities of the different types of furnace, but to avoid any disposition to shift responsibility upon the local tradesman.

It is possible that a client, even in a small house, may desire for the sake of ventilation, to use large registers and pipes, and bring in an unusually abundant provision of air, at a temperature more moderate than that furnished by the simpler type of furnace. He should be warned that, with such a system, he will have more difficulty in conducting the warm air to a distance from the furnace, as the ascending tendency of warm air, by means of which it is led through pipes inclined slightly upward, is directly proportional to the difference in temperature between it and the outside air; but there will otherwise be no difficulty in satisfying him, by a selection of a furnace with a suitably enlarged heating surface, by means of which the quantity of air that he requires can be warmed. As the number of rooms to be heated, or the volume of warm air required, increases, the heating surface of the furnace must be increased also. Most responsible manufacturers of furnaces publish tables of dimensions and capacities of their furnaces, from which a choice can be made. It is not for their interest to mislead purchasers into buying too small a furnace, so that, although for large houses or buildings in exposed locations the minimum figures of the table should be used, these should be found tolerably reliable.

The contrary is the case with local tradesmen, figuring in competition with each other, with the understanding that the lowest bidder will get the job. Under these circumstances, unless the architect has specified the size and make of furnace, and the sizes and positions of pipes and registers, and has required a guarantee from the contractor to heat every room in which there is a register to 70 degrees, taking fresh air from the outside, when the thermometer out of doors stands at zero, it is likely to turn out that the successful bidder expects the owner to take air from the cellar in cold weather, in order to make up for the deficiencies of a furnace far too small to heat air fresh from out of doors to the necessary temperature.

Where there are many registers in a house, the furnace must be materially larger than would be required to furnish the same amount of hot air through a smaller number of registers, as there is loss by radiation in carrying air through tin pipes; and it should be remembered that, the larger the number of pipes and registers, the greater will be the difficulty of securing even distribution of the hot air.

In the details of furnace construction there is quite as much variety as in the general design, and nearly every manufacturer controls some valuable feature. Practically all furnaces are now fitted with some modification of the Smyth, or triangular-bar, grate, consisting of four or more bars, with triangular flanges, geared together, so that a slight rocking sifts out fine ashes, while, by turning the bars over, cinders and clinkers above the grate are seized and deposited in the ashpit below, but there are other good grates, which are preferred by some people and can be substituted for the triangular-bar pattern in furnaces adapted to them. Of the triangular-bar grate, also, there are various patterns, the best being made so that any bar can be removed and replaced by a new one, in case it should become warped by the heat of the fire, as sometimes happens.

There is also a choice among furnaces in respect to ease of cleaning. The old-fashioned, complicated brick-set furnaces were cleared of ashes with difficulty, and modern improvements have been directed, to a great extent, toward making all parts easily accessible. The soot and fine ashes which accumulate wherever they can lodge in the flues and radiators of a furnace begin, as soon as the fire is put out in the spring, to absorb moisture from the atmosphere, becoming first damp, and then wet. In this condition they communicate rust to all surfaces of iron with which they may be in contact; and, unless they are removed, much damage may be done. Cast-iron is much less subject to corrosion than wrought-iron, and is used in thicker plates, but it is destroyed in time; while soft steel plate, which is generally used in the so-called wrought-iron furnaces, is very quickly and seriously affected.

The provision of doors, by which every surface on which ashes can lodge may be reached and brushed or scraped clean, is therefore very necessary, and the merit of any particular furnace depends largely on the way in which this requirement is met.

The old-fashioned "clinker doors," by which the clinkers and cinders which collected just above the grate could be pulled out with a special poker, are now rarely provided, the improved grates dealing so effectually with clinkers and cinders that special treatment is no longer necessary; and the water-pan, with the door for filling it with water, which was once thought indispensable, is omitted from many modern furnaces. There are, however, people who really suffer in a dry atmosphere; so that, in selecting a furnace for a client, his preference in this respect should be ascertained, and a choice made accordingly.

With these data, there should be little difficulty in making an intelligent selection and in securing, for any house of moderate size, an apparatus which will do all that can reasonably be expected of a furnace. In any case, the furnace should be larger than the conditions indicate, rather than smaller. To say nothing of the importance of providing a margin of heating capacity for those exceptional days when it is most needed, a large furnace is much more economical than a small one. Not only is more heat obtained, with less expenditure of fuel, by means of a large mass of coal, burning moderately, than by the furious combustion of a small quantity of coal, but the trouble of attendance is less in the former case, the heat is more steady and less affected by changes of wind, and the risk of cracking the fire-pot, or dome, or doing other damage, is much smaller.

Where the house is in an exposed situation, or the horizontal pipes are long, it is often judicious to choose a furnace

with comparatively small radiating surface, as the air from such a furnace, although less in quantity, is hotter than that from one with a more extended radiating surface, and is therefore distributed with greater certainty. Of course, the furnace, whatever the type, should be of sufficient size to supply warm air to all the pipes, but with a furnace of relatively small radiating surface the pipes, as they convey hotter air, are usually made smaller than those from a furnace with an extended radiating surface. At the same time, although the air from a furnace of the latter sort is delivered at a lower temperature, there is more of it, and the ventilation afforded by it is therefore better; so that the architect and his client may with advantage weigh all these points before making their decision.

As the proper working of a furnace depends very much upon the way in which it is set, the architect should provide a suitable place for it and should always show it on his plans, indicating also the courses of the tin hot-air pipes and the cold-air box. The most essential requirement is to have a high cellar to put it in. As hot air runs up-hill, just as water runs down-hill, only much more slowly, it is necessary to give a suitable slope to the conduits conveying it, to prevent stagnation; and this slope can only be secured in a high cellar. For a compact house of moderate size eight feet is sufficient, but if any of the horizontal pipes to first-story rooms will be twenty feet long, or more, nine feet should be secured, if practicable. A room at a distance from the furnace should have its register in the corner nearest to the furnace, so as to shorten the horizontal pipe as much as possible; and a pipe to an upper story may with safety have its horizontal portion much longer than would be allowable for a pipe supplying a first-story room, as the upward current in the vertical portion of the pipe helps to draw the air through the horizontal portion.

In general, a furnace should be set near the centre of the house, so that the distribution may be uniform all around it; but if not exactly in the centre its position should be rather toward the north, or west, as during cold winds there is a tendency of the air in the house toward the lee side of the building, which may be compensated by making the pipes to the rooms on the cold side shorter and more direct than the others.

It is usual now to cover the tin hot-air pipes with asbestos paper. Whether this is always advantageous is, perhaps, uncertain, but it is at least desirable where pipes pass through cold rooms or behind furrings, and in such places the pipes should also be made double, with ¼-inch air-space between the inner and outer pipe. As the capacity of a hot-air pipe is proportional to the square of the diameter, while the surface at which loss of velocity by friction and loss of heat by radiation take place is directly proportional to the diameter, there is a material advantage in conveying air always through the largest practicable pipes; and two registers in the same story may sometimes be more satisfactorily supplied by a pipe of sufficient capacity for both than by two separate pipes. Two registers in different stories cannot, however, safely be supplied in this way, as the superior velocity of the current in the higher pipe will draw the air from the register in the lower story, unless a damper is put in to shut off the upper room entirely while the lower room is being warmed.

Large furnaces usually stand over a shallow pit in the cellar floor, into which the fresh air is brought from the cold-air box. This gives better distribution of the incoming air and prevents it from blowing up cold into the pipes on one side of the furnace, so that it is advantageous with a furnace of any size.

VENICE UNDER REPAIR.

THE Venice correspondent of the *Morning Post*, in a communication of the 21st ult., writes:

More than four years have now elapsed since the Campanile fell, and at the present moment the highest part of the new tower is not more than 18 feet above the surface of the pavement, there thus remaining 304 feet to be constructed before it reaches the elevation of its predecessor. Much time was necessarily devoted to the foundations, which have been laid with the utmost care, and which were finished last year, but since the beginning of July not a single stroke of work has been done at the tower, nor is there any probability of its immediate resumption. The cause of this stoppage is the opposition which has arisen to the construction of the tower and the consequent appointment of a commission to inquire into and report on the work done. Pending the final report of this commission—a preliminary report has already been issued—all work has been suspended.

The objections raised to the new tower are mainly four. Critics object that the bricks employed contain a large percentage of sulphates which exude through the sides and form a white deposit on the outside of the tower. This phenomenon is obvious to all who examine the building; I have myself rubbed off a layer of white deposit from some of the bricks. But people who have lived many years in Venice point out that all, or most, of the bricks used in the Venetian buildings are discolored in the same way, and that it does not in the least follow that the bricks of the new tower will crumble away any more than that the white efflorescence will affect the mortar in the interstices and tend to dissolve it. From the part of the tower which is exposed to the sun the white powder has entirely disappeared; it is only on the shady side that it is still to be found. The second criticism is directed against the mortar, which is of the nature of Portland cement. It is argued, not without some reason, that pozzolana, the most binding and most durable of all mortars, should have been employed for a work which is intended to defy the ravages of time. Roman architects are wont to compare the extraordinary durability of the ancient Roman buildings, in which pozzolana was used, with the greatly inferior powers of resistance exhibited by Mediæval buildings at Venice and elsewhere, in which other cements were adopted. But there was this objection to the use of pozzolana for the new Campanile, that though it is not more expensive than the cement actually employed, it takes twice as long to set, and therefore the tower would have occupied much longer to construct—a feeble argument in the case of a monument which should be *ære perennius*. From the materials used the critics then turned their attention to two details of construction. It will be remembered that the new Campanile was to be an exact copy of the old. But it does not seem to have occurred to any one to ask the simple question which particular period in the old Campanile's long life was to be copied. Some not unimportant details of that venerable building varied with age. For example, it was originally constructed with five steps at the base, and the new tower faithfully reproduces these five steps. But at the time when the old Campanile fell and for at least a hundred years before, owing to the rise in the level of the Piazza, two of the original five steps were below ground and only three were visible. Therefore, argue the critics with truly Byzantine subtlety, the new tower should, like that which we were always accustomed to see, have only three. Finally, the inside of the old tower was supported by eight pillars, while there are only four within the new, and this deviation from the ancient model has naturally not escaped the notice of the opposition.

"The Opposition" is, indeed, the right word to use, for politics, as they are understood in Venice, enter largely into this question. I do not mean that the supporters of the Triple Alliance are necessarily advocates of five steps, or that pozzolana instead of Portland cement is an essential item in the Irredentist creed. The fact is that politics here are largely a question of local persons, *campanilismo*, as the Italians call it, which very appropriately settles round the Campanile. The defenders of the new tower maintain that full and elaborate plans and models were publicly exhibited before the work began; that none of the present criticisms were then heard—though there was a party which was opposed to rebuilding the tower at all—and that now, when nearly a year has been spent in building the first section, the then silent critics have opened their mouths and have caused the suspension of the works, perhaps as a preliminary to a fresh start being made from the foundations. Professional jealousy is perhaps not more acute in Venice than elsewhere, but I have heard it said that if at the outset the authorities had put every Venetian architect on to a committee for the Campanile these acute rivalries would not have arisen. Every one's ambition would have been satisfied, and a small subcommittee chosen from the larger body would have really done all the work. Such expedients are used, as every one knows, by modern British Prime Ministers; eighteen or nineteen people with "claims" form the Cabinet; three or four of them

actually govern the country. As it is, were the Campanile resumed on the present plan to-morrow, three years more must elapse before Cook conducts his first tourist to the top.

Happily, the more celestial minds engaged in the task of saving St. Mark's from destruction are not torn by these professional feelings. Except in the case of the workmen employed in the Roman Forum, I have never seen men so devoted to their work from sheer love of it as those employed on St. Mark's. The greatest of all Italian churches inspires even the humblest mason with something of that sentiment which the ancient Athenians felt for the Parthenon, which an English verger sometimes shows for the grey fabric which dates from the dim days of the Saxons. "No expense could be too great to preserve the basilica of St. Mark's," a Venetian architect observed to me, and the speaker was a man whose whole life centres in that gorgeous fabric. But long years must elapse before the last piece of scaffolding is removed from the church of the Evangelist. At the present moment work is being actively prosecuted in no less than four separate points of the building, while at two others the preparations for repairs are now made. First and most noticeable is the task of making good the fissures that have appeared in the atrio, or vestibule. The part to the right of the main entrance is now entirely closed to the public, and there the engineers have had a difficult problem to solve. The great columns which stand there have been split by the oxidisation of the iron clamps inside the base and at the top of each, and it has been necessary to raise the capitals, which, fortunately, have nothing resting on them, by means of a crane, extract the oxidised iron, replace it with bronze, lift up the whole column for the same operation at its base, and then replace each column and capital in its former place and at its former angle, slightly out of the perpendicular. Two columns have already been treated successfully in this way. In a fortnight's time another pair will be taken in hand. Inside, right up to the roof, there now stands a vast and massive scaffolding, four stories in all, made of American pitch pine, which looks as if it were meant to last forever. The roof was cracked in this part, and the mosaic has consequently been partially removed. Complaints are made in Venice that this operation is frequently misunderstood abroad, and it may therefore be well to describe how it was accomplished. An impression of the mosaic is first made on specially-prepared paper—*carta da filtre* as it is technically called—which, being porous, receives an exact impression of each separate piece of mosaic. This paper is then colored with the precise colors of the original and serves as a pattern. The mosaic is then taken off in strips of about two or three feet in length and is laid on the wooden floor of the scaffolding in exact order just as it was on the wall of the basilica. All the mosaics of the Tribune of the Patriarch, for example, which had begun to fall, are now lying in this position. The architects claim that when a wall has been repaired and the mosaic replaced it is impossible to distinguish any difference between that which has never been moved and that which has been temporarily taken off. Certainly an untrained eye finds it impossible to say where the division between the two begins.

From the vestibule we pass to the above-mentioned Tribune of the Patriarch, now stripped of its splendid dress. Here one of the arches has given way, part of the Byzantine cornice has slipped about an inch, and the circle of the cupola has been so displaced as to be now an ellipse. Emerging through a dark and narrow passage on to the roof and scrambling over the leads, we find that the men are at work on the central cupola, where more than half of the woodwork and the lead which covered it has to be renewed. At the cupola of the Madonna the mosaics have been already replaced, but the work of strengthening the supports of the cupola is not yet finished. More serious will be the repairs at the corner of Sant' Alipio, which faces the Piazzetta dei Leoni, and which needs drastic overhauling, as its walls are in a bad state. The last item in the present programme is the repair of the dome of the Apocalypse, the plans for which are complete. There is no lack of funds for St. Mark's. The Austrians endowed it with 2,040*l.* a year, and for many years there were large savings out of this income which are now available.

STEVENS'S WELLINGTON.—Good progress is being made with the modelling of the equestrian figure, by which Alfred Stevens's Wellington Memorial in St. Paul's Cathedral will be completed.

THE EASTER ISLAND MONOLITHS.[1]

THENCE came they? The Kanakas give two versions with regard to their origin, and these traditions they readily admit are doubtful—a Kanaka never troubles himself to argue. The first is that the founders of their race came, many cycles back, in four ships with raised poops and prows, under the command of a king, Hato or Incuyo. The men were of mighty stature, and, when they had landed, put the head of a decapitated maiden at the prow of each vessel, which immediately plunged under the foam. The second tradition relates that thousands of generations back a migration took place from Oporo or Rapa-Ita, one of the Low Archipelago; hence they call their present abode Rapa-Nui or Great Rapa to distinguish it from Rapa-Iti or Little Rapa. Incuyo divided the island and women among his followers.

The question has been asked how came those three hundred or more statues, from five to fifty feet high, placed in position all over the island, on ridges, on the edge of overhanging cliffs, on stone-platforms, in the midst of altar groves, in recesses; sometimes alone, or in groups of from four to thirty? These monoliths are carved out of stone, some of trachyte lava, nearly all presenting the appearance of torsos terminating at the hip, sometimes with arms close to the side, now and again with hands sculptured in low bas-relief on the haunches. The head is flat, the top being cut off level to allow a "hat" to be put on. These "hats" are usually round and carved out of red tufa. In most cases these head-gears have rolled off and lie beside the giant monoliths as if the gods had cast them down in despair or rage at the decadence in their worship. The faces, generally speaking, are square, massive, disdainful in expression, the aspect always upwards, the lips thin, the upper lip short and the lower lip thrust up. The eye sockets are deep: in former days balls of obsidian were inserted, giving a terrible expression to the giants. At present, the eye sockets form nests for birds. The nose is broad, the nostrils expanded, the ears with long pendant lobes. At Utuiti, the most curious feature of the island presents itself in three stone platforms, crumbling away. On each side eight monoliths, some sixteen feet high and about seven feet over the shoulder, stood side by side. At present they are nearly all upset and broken. These mohias at Utuiti, described by Captain James Cook, are by no means the largest, for at Rana-Roraca, Hanga-Roa, Rana-Kao, Ponapav, Rana-Hana-Kana and Vai-Hoo, some measure not less than fifty feet and more. At Rana-Hana-Kana there are twenty-three, made of hard rock and in a perfect state of preservation. At Hanga-Roa the greater part are upset, and children amuse themselves chipping off the noses, ears and inscriptions.

A few bear traces of carvings representing birds, axe-heads, paddles, and occasionally animals. Of these monoliths, but very few have found their way to the Old and New Worlds. One is to be found, I believe, at the Santiago Museum, Chili; one at the British Museum, London, brought over by a British man-o'-war and presented by the late Queen Victoria to the nation; another, brought over in 1870 by a French frigate, was found by Mr. Edwin S. Balch stowed away in a shed of the Paris Jardin des Plantes surrounded by a lot of old scrap-iron and rubbish. Describing his "discovery," Mr. Balch says: "One of the most extraordinary works of art in Paris is the colossal head from Easter Island, now in the Jardin des Plantes. It is about six feet in height, with a great, highly-modeled nose, deep cavernous eyes, a tiny slit of a mouth and a strong square chin. The ears are long, but not much worked out. There is scarcely any head back of the ears and a very low forehead. It almost seems as though the head was only intended to be looked at from the front. It is most dignified, neither childish nor savage, but decidedly advanced art."

Nowadays, with all the engineering appliances at command, it would be impossible to move many of these monoliths. There is absolutely no trace of metals on the island; there is no timber, no cordage; the island is more than two thousand miles distant from its nearest neighbor, Tahiti. It is impossible for these large masses of rock to have been broken off in such equal proportions, and, after having been carved, carried to their destination, for many of them weigh certainly more than two hundred tons.

Who were the sculptors whose work is surprisingly far from being rough or unskilled? Their work is as curious as the Idols and Temples of the Sun in Peru and Mexico and Guatemala,

[1] Extract from a paper by Mr. Victor Strauss Frank published in the "Journal of the Franklin Institute."

as the dolmens in Wales, the Pyramids, the giant temples of Luxor and Memphis, the towering gods of the Bhotan; more so, when we consider the geographical position of Easter Island. Another question arises, to what purpose, and by whom inhabited, were those stone caverns, in the shape of an inverted canoe, three feet high, three feet wide and from three to forty feet long? The most obvious agent in hollowing out caves, we know, is water, but these rock hollows, if not made by man, were formed, we are inclined to believe, by the passage of lava to the surface of the ground or by the imprisonment of steam and gases in the lava while it was in a molten state. Yet, in spite of our doubts as to whether these caverns were or were not the work of a prehistoric race, we are forced to admit that our perplexity is great upon finding the entrances of these caverns guarded by a stone door. Inside there is no trace of their having been occupied, except a few scant inscriptions and figures, and in some a sealed pavement, which shows evident proof that this once served for some purpose, for, when opened, it revealed under the entire length of the passage numerous deep pits. In others, large quantities of univalve shells were found, and in one, a monolith differing from the others to such a degree as to render it more interesting still. Roughly estimated, it weighed about fourteen tons and was eight feet high. In no instance has there been any trace found in these caverns of gold, silver, brass. They are empty.

Much attention is directed to the stone houses or huts, mostly fallen in ruins, made of stones laid one upon the other. These evidently are not so antique as the caverns.

Of wooden images or idols, there are a few yet found, but they are jealously guarded by the old natives as relics of a past age. These idols in which the vertebræ and ribs are very pronounced, have strong Semitic features, and have none of the solemn repose of the colossal monoliths. The worship of wooden gods was much later than that of stone gods. Slabs of toromiro wood bearing hieroglyphs are likewise found and have been dwelt upon at length by the learned world. The wooden tablets are about fourteen inches long by five inches wide and one inch thick. One "specimen" is at the Santiago Museum, another at the British Museum, another in Paris. We pass over in silence the long stone passages, now in ruins, leading down to the sea. Were they the roads leading from a royal palace?

Some day perhaps Easter Island will hold a prominent position in the history of lost races. For it is here that the gigantic monoliths, curious hieroglyphs, caves, etc., offer a thread, binding the past with the present, a link all the more interesting when we consider its unique geographical position. During cycles of centuries the now extinct race must have advanced towards a high degree of civilization, not in the mind of the trader or missionary perhaps, but certainly of the artist when the latter contemplates the mohias [? menliers] which seem to point to a period when a powerful race lived on that island; then; perhaps, a continent, if no longer so in the times of Davis.

Tradition does not reach to that remote past; alone the monoliths are all that remain to bear evidence of a lost and mighty power of human labor, of art, of skill, of immense conception.

Naught have we learned of the prehistoric race. The natives also, who now inhabit Easter Island, are so little known that they are well worthy of the interest of the ethnologist. Their undoubted antiquity and ancient language all combine to render them a peculiarly interesting race.

ILLUSTRATIONS

HOUSE ON THE RUE CLAUDE CHAHU, PARIS, FRANCE. M. CHARLES KLEIN, ARCHITECT, PARIS, FRANCE.

For description see article "Terra-Cotta Architecture in Paris" elsewhere in this issue.

DETAILS OF THE SAME.

WINDOW DETAILS OF THE SAME.

HOUSE OF ROBERT E. STRAWBRIDGE, ESQ., BRYN MAWR, PA. MR. MANTLE FIELDING, ARCHITECT, PHILADELPHIA, PA.

HOUSE OF JAMES N. STONE, ESQ., CHESTNUT HILL, PHILADELPHIA, PA. MR. MANTLE FIELDING, ARCHITECT, PHILADELPHIA, PA.

HOUSE OF J. N. DOUBLEDAY, ESQ., MILL NECK, LONG ISLAND, N. Y. MESSRS. KIRBY, PETIT & GREEN, ARCHITECTS, NEW YORK, N. Y.

WATER-FRONT OF THE SAME.

Additional Illustrations in the International Edition.

A DUTCH WEIGH-HOUSE.

CENTRAL RAILROAD STATION, AMSTERDAM, HOLLAND. DR. P. J. H. CUYPERS, ARCHITECT.

HOUSES AT ALKMAAR, HOLLAND.

TEYLER'S MUSEUM, HAARLEM, HOLLAND.

NOTES AND CLIPPINGS

HERALDRY TO THE AID OF LAW.—The presence of Armorial inscriptions on a building has decided complex law cases. There is the incident of an ancient church which formed part of a contested estate, and in searching for evidence of prior possession Lord Eldon had the old plaster—containing the Ten Commandments—chipped away. Underneath was found the coat-of-arms of an ancestor of one of the parties to the suit, which decided the issue in his favor. And as Lord Eldon said, he was very glad he had broken the Ten Commandments.—*E. W. Dobbs.*

BURSTING OF THE VRYNWY WATER-MAIN.—Although steel pipes were used in some parts of the original aqueduct from Vrynwy to Liverpool, cast-iron was chiefly adopted in the siphon, 17 miles 5 furlongs long, between Oswestry and Malpas, and the diameter of the pipes was reduced from 42 in. to 39 in. The maximum head of 480 ft., about 208 lbs. per square inch, occurs at the Wych Brook, where the water is carried beneath the stream through steel tubes. In the same siphon the aqueduct passes by cast-iron pipes in subways under the Oswestry branch and the Shrewsbury and Chester lines of the Great Western Railway, and at Hindford the pipes are carried beneath the Shropshire Union Canal in a bed of puddled clay. Under the small stream, described as the River Elfee, the cast-iron pipes were encased in mass concrete, and this was the point where the alarming failure took place on Saturday last. Bursting out with an explosion that was heard throughout the valley, a column of water rose to a height of 100 ft., throwing up masses of concrete and pieces of rock, while many tons of earth were washed from the hillside into the river-bed. It is stated that subsequent examination revealed the fact that a piece of metal, 2 ft. by 1 ft., had been blown from the side of the pipe. This mishap certainly points to the desirability of steel pipes in the case of all water-mains under heavy pressures, and especially in positions where they are inaccessible except by tunneling operations.—*The Builder.*

DIVING AT WINCHESTER CATHEDRAL.—When the work of erecting Winchester Cathedral was commenced, in 1202, the foundations, it appears, were formed by laying large trunks of beech trees across and across in layers upon a bed of peat (!), the interstices being filled in with flint and chalk. It is hardly to be wondered at, therefore (says the *Pall Mall Gazette*), that in the course of time the immense weight of the structure has caused the foundations to sink, so that the walls are now in places nearly 2 feet out of the perpendicular. The chief work in progress at the moment is the underpinning of the walls to arrest this mischief, the process being described in the report as follows: A hole is dug close to the foundations down to the peat; when this is reached the hole is continued under the main wall 9 feet from the front, and the timbers, flints, etc., removed down to the top of the peat. There is scarcely any water until about 1½ feet or 2 feet above the top of the gravel, but as soon as this depth is reached the water fills the hole to a depth of 6 feet or 7 feet. The diver then removes the remainder of the peat, and places bags of cement concrete, well grouted, on the top of the gravel, which prevents the water from rising. When he has completed one layer of concrete bags, he slits open the top of each bag and lays another upon it, which adheres to it; in the same manner a third is placed on the second, and so on. When 3 feet or 4 feet of the concrete have been put down the grouting machine forces in liquid cement, which fills up all interstices and unites the whole into one solid rock. The water having been sealed down by the concrete, ordinary bricklayers lay courses of specially-burned hard bricks with cement upon a rock of so broad a base that no movement is possible. It is interesting to note that the diver employed upon this dangerous work was, on account of his reputation, asked for by the Government during the attempt to salve the ill-fated "*Montagu*" at Lundy Island, but the authorities decided that he could not be safely spared from his work at the cathedral. The spreading of the walls has, of course, severely strained the roof of the cathedral, and a great part of the groining will have to be taken out and rebuilt, both in the retro-choir, where the chief of the damage is located, and in the nave itself. This portion of the necessary repairs was not allowed for in the original estimate, so that a larger sum of money will have to be forthcoming than was at first supposed. Sundry other repairs to the pinnacles and the west front of the cathedral are also urgently needed.

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EVER since, six or eight years ago, he read a paper on acoustics at a convention of the American Institute of Architects at Washington, architects not only in this country but all over the world have felt that they had good reason for feeling an interest in the career of Professor Wallace C. Sabine of Harvard University, for had he not given convincing proof of an ability to solve a class of problems in the mechanics of building that to the ordinary practitioner has always seemed more unsolvable than any others. For this reason architects will be pleased to learn that Professor Sabine has just been selected to succeed Professor Shaler as Dean of the Lawrence Scientific School, in which position he will be able to give direction to the development of the new Graduate School of Applied Science, made possible by the McKay bequest, quite as intelligently as would Professor Shaler himself. As Professor Sabine is not yet forty, and as he is only an adopted son of Harvard, having secured his bachelor's degree at the University of Ohio, his appointment to so important a post is a most flattering testimonial to his own character and capacity and the discernment of those with whom the appointment rested. It will be regrettable, perhaps, if the demands of his administrative duties should set a period to his own researches in the field of science, which have already won for him an enviable name.

IT is only within the span of the present generation that change has been made in the time-honored methods under which English architects acquired their professional education. The "articled pupil" is not entirely a thing of the past, but the classes of the Architectural Association, and particularly those of the Architectural School of the Royal Academy, not to mention even more youthful agencies, have done much to put the education of architectural students in England on a less haphazard basis than formerly. In this good work the efforts of one man have been of the first importance, and it is with regret that the profession has learned that advancing years have caused Mr. R. Phené Spiers to withdraw from the headship of the Academy School. How thoroughly his work has been appreciated was shown a couple of years ago by the testimonial banquet given in his honor by former pupils and by his contemporaries at home and abroad, and it must not be forgotten that included amongst the latter were many of the younger American architects, who had enjoyed the hospitality and friendship of a most interesting man.

THE old mental-arithmetic problem, "If two men can build so many rods of wall in ten days and it is necessary to build five times as much wall in four days, how many men must be employed?" is brought to mind by the very sensible letter addressed by Mr. D. F. Moore, Building Superintendent for the Borough of Brooklyn, to Borough President Coler, in which he renews his requests for increased appropriations in order that he may employ more inspectors and enlarge his clerical force. The figures he gives are rather startling, as they show that at the present time there are in various stages of erection 11,600 new buildings and 4,900 old buildings undergoing alteration, and that, hence, if the law is to be carried out to the letter, each inspector must visit daily 366 buildings scattered over a considerable area! Brooklyn architects who are so irritated by having their buildings "held up" through inability to secure the needful permit will heartily indorse Mr. Moore when he says, "Our request for one additional plan-examiner is altogether too modest. . . . We are handling about four times as much work in this particular branch, as compared to Manhattan, with a force of two examiners. In Manhattan they have six." Mr. Moore makes out a strong case, and the citizens of Brooklyn, whose safety and prosperity are so deeply involved in this matter, ought to see that he gets what he begs for and so evidently really needs.

IT may be doubtful, however, whether Mr. Coler can find time to give proper consideration to this very proper plea, for Mr. Coler seems to be involved in rather a time-consuming difference of opinion with the Trustees of the Public Library over his appointment of Mr. Almirall as the architect of that important building, and it looks as if matters were approaching a deadlock, since it is reported that at a special meeting last week Mr. Coler declared that unless the trustees agreed with him the matter would have to go before the Legislature for settlement. To this the trustees made retort by declaring that final acceptance or rejection of the plans rested entirely with the trustees. All of which must be deeply interesting to Mr. Almirall, who is in Europe visiting and studying important library buildings there.

Entered at the Post-Office at New York as second-class matter.

THE growth of the Roman Catholic Congregation in this country in number, wealth and power is very clearly marked by the number and extent of its important building undertakings. Cathedral churches have recently been finished in Richmond, Va., and Pittsburg, Pa., while the one at Newark, N. J., is nearly ready for the roof, and it is understood that the one at St. Louis is making satisfactory progress. Brooklyn, too, seems on the verge of providing a cathedral for the faithful of that community. But of all these undertakings there is no one more interesting than the cathedral which is to be built at St. Paul, Minn., after the design of Mr. E. L. Masqueray, which promises, when executed, to make that Northwestern city an even more interesting place for architects to visit than it is now.

IT is rather a surprise to find it stated that, though it has been in daily use and occupancy for some forty years, the Cathedral of St. Patrick, New York, has never been consecrated, since a debt of some two hundred thousand dollars remains still undischarged, and a Catholic church cannot, as we understand it, be consecrated until the last dollar of its cost has been paid. This small debt it is now planned to pay off, so that the building may be consecrated next fall at the time when the new Lady Chapel is expected to be finished and itself ready for consecration. As for the Lady Chapel, it is so satisfactory in itself, and yet so much more refined than the building to which it is attached, that one would be blind indeed not to be able to perceive that here was one of the best of the many justifications of the custom of architectural competitions. Mr. Matthews, a man of means, essentially a mere student of architecture, and more than half-inclined not to take up the active practice of the profession for which he had equipped himself, went into this competition a wholly unknown young man, won it, and has produced one of the real architectural achievements of which New York can boast.

IT is fortunate that our graver studies are now and then made lighter by the occurrence of some luminous incident, and surely no professional humorist ever thought of anything more droll than that an architect should be forced to sue for his commission on a jail building in which his client desired to incarcerate himself. It appears that one Louis A. Gourdain, a wealthy man, was convicted in the Federal Courts for the District of Illinois and sentenced to a term in the penitentiary. His lawyers, ignorant of his peculiar views, secured a stay of proceedings, and this displeased the convicted man, who desired to get his punishment over with as speedily as possible; then he proceeded to Joliet and asked the keeper of the penitentiary there to lock him up, but as he had no commitment papers to proffer, the jailor was unable to oblige him. Determined not to be thwarted, Mr. Gourdain declared he would build a prison for himself, hire a more complaisant turnkey and serve his time in aristocratic isolation, and so, it seems, he employed Mr. Frank Lindquist, an architect of Chicago, to design the needed prison building. This appears to have been done, although it is not clear whether the building was actually erected or not. In any event, the unfortunate architect is now suing his eccentric client for three thousand dollars due as commission, a fee which Mr. Gourdain declines to pay, desiring, possibly, to give conclusive proof that the proper place for him is behind stone walls.

A FEW years ago, while the salvation of the "Bulfinch front" of the Boston State House was still undetermined, a very potent public argument in favor of preservation was adduced by bringing about the repainting of the structure just at that time. The way in which the elegance of the design and the excellence of its proportions were brought out by the fresh white and yellow paint was very reassuring, and the manœuvre was not without its effect. Passing the building the other day, we noted how the joyousness of aspect had departed through the discoloring of the painted woodwork, no longer white, but a dirty drab, and yet a dirty drab that matched, tone for tone, the white marble finish of the newer part of the building. Presently the woodwork of the old building will have to be repainted. Will that mean that the marble must be sand-blasted, or will the building for a while be more piebald than ever, or must the woodwork be repainted in dirtier and more dingy tones, each time, to keep pace with the continuing degradation of the marble? Boston is not a smoke-cursed city, and marble should be distinguishable for more than a few years from light granites and sandstones, and yet it is not. The trouble seems to be that the marble most used nowadays has not the weathering qualities that pertained to stone taken from earlier quarries.

IT is worth putting on record, perhaps, that the Boston Grand Jury for September did not bring in a true bill against the Boston School-house Commissioners for misfeasance in office in the matter of the concrete used for the foundations of the Normal School buildings. It is regrettable that this city should be put to the expense of trying the case against the contractors, the George W. Carr Company, for we cannot but believe that the result of the trial will be another out-and-out defeat for the extraordinary person who now fills the office of District Attorney, and who hopes next year to occupy the gubernatorial chair.

IF the present unreasoning popular feeling against trusts, whether beneficent or maleficent, is to continue to grow, it begins to look as if the building operations of the country might be seriously interfered with. We fancy that most architects who have had to do with them would agree that master-builders' associations, building exchanges, etc., were rather beneficent than evil bodies; yet we can conceive of these institutions so mismanaging their affairs as to become distinctly detrimental to the prosperity of the communities in which they operate. It seems possible that the Builders' Exchange of Youngstown, O., may have adopted some of the indefensible tactics of the lawless "trusts," for it is said that its doings are to be examined by the Grand Jury for Mahoning County, and that if a case can be made out against it, its members will be unsparingly prosecuted.

ARCHITECTURAL SCULPTURE AND ITS MATERIALS.

THE growth of the country in wealth and population and the general improvement in taste are very strongly indicated in public buildings. Utility is no longer the sole requirement. Architectural beauty is given due consideration by building-committees. National, state, and municipal governments vie with each other in their public edifices. Private corporations of great wealth house themselves in structures that a generation or two ago would be thought available only for kings and potentates. Costly material and elaborate ornamentation are characteristic of all these buildings. The choicest work of the stone-cutter adorns the outer walls. Within are found exquisite metal-work and the rarest marbles from European, African, and Asiatic quarries. Great artists embody in mural paintings their imaginative and historical creations. But sculpture, in its highest manifestation, the representation of the human form in the round, plays but little part in the ornamentation of our buildings. And yet it is a form of art which has the very closest association, both historically and æsthetically, with architecture. It is true that one can name a few notable buildings of recent erection in which sculpture has representation, but these are the exceptions that prove the rule. There are numberless structures upon which millions have been spent in lavish adornment, and yet which show sculpture only in purely architectural ornamentation—in a word, in "stone-cutting." There must be a reason to account for this failure to utilize so exquisite a branch of art. It is interesting to consider what this reason may be, and whether it is necessarily operative.

No one can urge that there is a lack of competent American sculptors. Our progress in all forms of art has been so notable as to awaken comment all over the world. Since Sidney Smith rankled us by asking who read an American book or looked at an American picture or statue, we have produced many authors and artists who confessedly stand in the very front rank. It is true that the lure of the brush and palette is stronger than that of the spatula and chisel, but we more than hold our own in sculpture; therefore we have abundant genius at our disposal. Nor is there any lack of money for the payment of art of this kind in building construction. Nowhere is money more freely spent in architectural elaboration. The marble-cutter is paid his hundreds of thousands of dollars and the mural painter his tens of thousands for a single monumental building. Can anyone doubt that funds would be available for the statuary that should fitly crown a noble structure? The reason that will account for this failure to make the most of opportunity is probably the very prosaic one of a scarcity of proper material for statuary. This, however, may be more apparent than real.

It is a truism that the material, *par excellence*, for statuary is white marble. The poet and sentimentalist will tell us that this is because of its purity and its delicacy of tint. Looking deeper, we know that the real reason is because almost every white marble has a peculiar and characteristic translucency. The light penetrates it for a distance. There seems to be an illumination from within, an irradiation of life, like the soul pulsating through the human flesh. This quality is due solely to translucency. If the stone were a bit more transparent, the charm would be missing. A statue carved of pure onyx (if such a material could be found) would be glassy, artificial, lifeless. It is this verging of translucency into transparency that unfits alabaster for sculpture in the round. The stone is sometimes used with good effect for bas-reliefs, but this is because the backing stops the penetration of the light. Next to translucency, and in the absence of it, the one quality needed in a material for sculpture is the ability to reproduce the most delicate surface modeling so as to show the texture of flesh and drapery. It may be as dense and opaque as any known substance, and yet it will be acceptable if it is responsive to every touch of the sculptor's chisel. Thus gold, silver, and bronze are properly statuary material, while iron, no more dense or lifeless than bronze in the mass, must content itself with the humdrum uses of commerce and manufacture. But bronze, suitable as it is for isolated statues on pedestals, can rarely be used in architectural sculpture. The slight corrosion from the weather would stain the adjacent stonework; there would be too great contrast with the main structural material, and all the detail of the modeling would be lost at the distance the beholder must stand, because of the lack of shadows, or, rather, their invisibility against the dark material. Putting aside the metals, the choice of stone after marble must be limestone. The opacity of this material takes away the great charm of "life," but it gives excellent effects as to texture. Sandstone and granite are not only opaque, but intractable as well, and hence are rarely anything but dull, hard, and lifeless, in statuary.

After this rough classification of the stones in their relation to sculpture, they may be considered in detail. The Greek sculptors were blessed with the choicest statuary marble that ever came from out the earth—the marble from the Island of Paros. This had a fineness of texture and a creaminess of tint worthy to receive the handiwork of a Phidias and a Praxiteles. Other and scarcely inferior statuary marble came from Thasos, Naxos, and Mt. Pentelicus. In order to give the color effects so greatly desired by the Greek artists, the sculptors also made free use of colored marble for drapery and accessories, combining it with white marble and bronze. The Romans were likewise fortunate in having a superb statuary marble, one that has retained its popularity for more than two thousand years—the output of the Carrara quarries, in which have been wrought all the great masterpieces of the mediæval and modern world. It is this very superiority of the Carrara marble that has had a most important effect in limiting the use of statuary on American buildings. This may seem a far-fetched statement, but I believe I can demonstrate its truthfulness. Nearly all of the artisans who point and cut statues in this country, carrying them along until they are ready to receive the finishing touches from the sculptor himself, are Italians. They have worked in scarcely any other marble, and they naturally believe that no other can compare with it in quality. The geological formation at Carrara is ideal. There are entire mountains of marble, and the quarries are known as "mass quarries"; that is, the stone is not in thin beds like most of the American deposits. It is possible to quarry sound blocks of any size that can be handled and transported. There is very little color, so calculation is not necessary in order to avoid dark bands and clouds. The stone is never "plucky," but breaks clean and free, so that the effect of every blow of mallet and chisel is known in advance. Finally, there are scarcely ever "cutters" or seams to open up and destroy the work when it is nearing completion. All of these qualities explain why the artisans who are to carry out the ideas of the sculptor discourage the use of any other material than Carrara marble. If they are asked to cut an American marble they may sound the block with a hammer, and if it fails to give out that clear, bell-like tone that is characteristic of Carrara, they will declare that it is seamy and shattered. Of course the texture of the American stone is not like that of the Italian, and the workman will make no effort to master it, to "humor" it, as the phrase goes. The question will be asked, Why not give in to these prejudices and use the foreign stone for all our architectural statuary? Oftentimes this is done, but there are good reasons why it cannot be done always. In the first place there is the question of cost. High-grade Italian statuary marble cannot be had in blocks of any size for less than ten dollars a cube foot, and what is known as "Guaranteed" stock ranges from fourteen dollars a foot upward. For gallery sculpture this is not so formidable, but it can readily be seen what a tremendous outlay it would mean for an entire group of heroic-sized figures such as would be called for in a huge public building. For exposure to the severe American climate a harder stone than the foreign marble is desirable. In architectural sculpture that is often elevated to a great height and that must almost always be viewed from a distance, bold carving is essential, and this can best be carried out in a material that has not too fine a texture, but that is rather coarsely crystalline. These considerations are weighty enough to discourage the use of statuary on our buildings unless they can be cut in a native stone.

America has many fine and large deposits of white marble. The best known and most extensively worked is that which runs in a broad belt through Vermont, New York, Massachusetts, and Connecticut down to the Island of Manhattan, where it is seen outcropping in the walls of the Morris ship canal. A continuation of the same belt, not so carefully traced, is worked in Maryland, Georgia, and Alabama. A third promising locality is in Colorado and a fourth in California. A peculiarity of the American deposits is that the nature of the stone changes abruptly. A dolomitic marble may be found close to a true carbonate of lime, and a fine and a coarse-grained stone are often in juxtaposition. This permits a wide range of choice in material from a limited territory. Vermont has a marble of true statuary grade. It is very white and of extremely fine grain. The price ranges from three to twelve dollars a cube foot. The objection in the way of the use of this for architectural statuary is the difficulty of obtaining large and sound blocks and its lack of strength. It is admirably

suited for small statuary, such as are called for in cemetery work. But it has nothing like the cohesion of the Italian stone, and sculptors would hesitate to use it where there were members not solidly supported from the pedestal. The dolomites present the same difficulty, especially those of fine grain. The cementing material that binds the grains together has not thoroughly hardened, and at some of the deposits it is possible to scoop up masses of the stone with the naked hand, where it has disintegrated in weathering to the nature of granulated sugar. The writer has seen in Connecticut an entire bed so disintegrated at the outcrop that it could be shoveled away. The coarse-grained carbonate of lime marbles of the New England belt furnish one of the best of the American statuary materials. It would not be desirable, of course, to use this marble for gallery sculpture, because the coarseness of the crystallization militates against delicate detail. This is a merit rather than a defect in architectural sculpture, however. Some of this stone has rather more color than is desirable, but it is possible to obtain it of a sufficient degree of whiteness if care is exercised in the selection.

The new court-house erected in Newark, N. J., for Essex County has a number of heroic-sized statues. They called for blocks of ten and twelve tons each. In the models some of the arms, drapery, and accessories were entirely unsupported. The carvers hesitated to attempt this in anything save Italian marble, but this was out of the question because of the cost. The architects accepted a medium-grained stone quarried at South Egremont, Mass., and the result satisfied every expectation. Out of the nine blocks first furnished, one had to be replaced because of a seam that became apparent as soon as the "roughing out" was attempted. The stone is very white and pure, and it has all the translucency of Carrara marble. But it is only fair to show the other side of the argument as to American stone. For the elaborately carved pediment of a great New York building a Southern marble was used. In appearance and analysis this is very similar to the Massachusetts marble, except that the crystallization is coarser. This might be expected to give it a greater strength, but when it was carved unsoundness was developed. Heads, arms, and legs showed a tendency to drop from the trunks. In order to hold the statuary together it was necessary to use hundreds of dollars worth of bronze dowels, and the sculptors declared that they would never undertake another job in this material. There is a geological reason for this difference if one will seek it. In the Massachusetts stone metamorphic action has been carried farther than in the Southern marble. In the former, whatever color there is will be found in faint clouds, with absolutely no change in the crystallization. In the latter the color is more often in bands and streaks. If this darker material is carefully examined it will be found that it is limestone that has not yet become completely crystallized and metamorphosed into marble. It is this lack of complete unity that gives the element of weakness.

Within the past few years there have been opened up in Maryland extensive deposits of cream-white and variegated marble. Nothing more beautiful of its kind is found anywhere. The cream-white has the warm, soft tint of old ivory. The texture is so fine that the crystallization is almost invisible to the naked eye; and yet the cohesion is so perfect that the stone will hold the sharpest arris. In many ways the marble would be an ideal one for statuary. Unfortunately, the deposit does not lend itself to this purpose. The bed of white stone is very thin and large blocks cannot be obtained. There are also streaks of limestone running through the marble. It is well suited for bas-reliefs, as it will take the most delicate carving possible in any stone. This marble is used in one of the elaborately carved tympani over the entrance doors of St. Bartholomew's church, on Madison Avenue, New York. Another tympanum is of the choicest Carrara marble. A fair and frank observer will scarcely hesitate to award the palm to the American stone. With such a material at hand it is a shame that we neglect one of the most interesting forms of monumental art—mural tablets. The bare walls of our churches cry aloud for such adornment.

The new Custom House in New York is particularly interesting in its use of sculpture. The number of statues, the felicity of the choice of subjects, and the diversity and yet harmony of treatment are all notable in the history of our architecture. Worthy of comment, also, is the material of which the statues are carved. This is the light pink Tennessee marble. It is a hard, dense, sound stone that has long been held in high favor for decorative purposes. Used in slabs, the polishing brings out the color. When carved it has a cream tint. While there is not the translucency of white marble, of course, there is none of the dense opacity of ordinary limestone, sandstone, or granite. At the height at which they are placed the effect is almost precisely that of white marble. The success of these statues opens up an unlimited supply of sculptural material that can be had in sound blocks of any size at a reasonable cost.

During the long reign of Indiana limestone as a favorite material of construction considerable sculptural work in the form of Caryatides and Atlantes has been wrought in this stone. The effect is almost always pleasing, despite the opacity of the material, because of the delicacy of the tool work that is possible. Strangely enough, most of this sculpture has been in the blue variety of the stone. This is harder and stronger than the buff, but the durability of the latter has been fully proved. The buff would undoubtedly give a brighter and more lively effect. The oölitic limestone of Indiana and Kentucky has a wide range of tint, and some of it runs almost white. It would be an interesting experiment to make use of the lighter colors for isolated statuary, where uniformity with the structural material is not imperative.

For many generations sandstone has been used in the Old World for statuary for cathedrals and churches. Although no sharp distinction has ever been made, this is what is known as "architectural sculpture," as distinguished from pure art statuary for architectural purposes. For the stiff and formal lines and the lack of delicate details in this class of work sandstone is very suitable. The best effects are shown in the warm tints, the pinks and reds, rather than the buffs and grays. An excellent example is furnished by the four Evangels at Trinity church, New York. These are carved in the famous Dumfries sandstone from Scotland. A stone precisely similar to this in color and texture is found in Colorado. Our many other pinks and reds are so familiar as to need no mention in this connection.

Granite has been used for the statuary on the Hall of Records, New York. It is a fine-grained, light stone, and elevated so high above the street, its opacity, intractability, and lifelessness are not so apparent. A large number of our states can furnish fine-grained, light-colored granite in sound blocks of any size, but the expense of carving such a hard stone will prevent its wide use for statuary even if the material caught the fancy of architects and sculptors. As it is, there is no reason for turning to granite as long as marble is available.

What has been done in the isolated instances mentioned shows that architects need have no fear in calling for statuary for their buildings because of any difficulty in supplying a suitable native material. The statuary carvers will continue to clamor for Italian marble, because it is the stone with which they are most familiar and presents the fewest difficulties. But with a little care architects can specify an American marble at from three to five dollars a foot that will fill all requirements and yield superb effects. No stone should be specified until a thorough inspection has been made of the quarry to ascertain beyond all question that the marble has not been shattered in its natural bed by any convulsion of nature or by improper quarrying methods. Then it should be learned whether there has been complete metamorphism, or whether unaltered limestone penetrates the crystalline mass. Simple tests will show whether the cementing material has hardened sufficiently to hold the calcite or dolomite crystals firmly in their matrix, so that they may be broken through without crumbling out. Finally, if the stone is suitable otherwise, the statuary blocks should not be accepted until they have been thoroughly proved for soundness. Every block should be smoothly finished on three sides and then be almost microscopically examined while wet for signs of seams, "reeds," or "cutters." After all of this has been done the marble can be confidently counted upon to pass safely through the supreme test of the "banker." It may seem a formidable task in the enumeration, but, after all, it is a small price to pay for the satisfaction of having one of the crowning achievements of architectural art, for, when all is said, Architecture can look no higher than when she calls in Sculpture as her handmaiden.

THE CHATEAU DE MADRID.

IT was rarely the late Mr. Fergusson expressed regret over a vanished building. He was so confident in his own power to improve buildings which are generally considered as masterpieces, he may have imagined that those which are only known by tradition were also imperfect. One of the exceptions to his general treatment is the Château de Madrid, which was due to Francis I. To French eyes it was a wonder, although they were accustomed to gaze on many remarkable buildings. In describing

some of the French Renaissance works of the sixteenth century Mr. Fergusson wrote:

"The palace, or château, of Madrid, in the Bois de Boulogne, at Paris, is another production of the same age, the loss of which is more to be regretted (it was destroyed in the Revolution) than that of any other building of its period. From the drawings of it which exist it seems to have been of remarkably elegant design, and to have approached more nearly to the palatial requirements of the age than almost any other. It was not very large, being only 265 feet in length by 112 feet wide, but it was four stories in height, and divided into three nearly equal blocks by square towers at each of the angles and two in each face. Standing on a good bold basement, the two lower stories were covered by arcades of very elegant design broken only by the towers, and variety and relief were given to the whole by the centre being recessed. The roof, though high, was far from being excessive, and the chimneys were treated as an essential part of the design. If we may judge from the testimony of those who have seen it and, more than this, from the representations that still exist, there was certainly no building for its size so palatial or to which the Transitional style was more happily applied, though it had not the picturesqueness of Fontainebleau nor the semi-feudal grandeur of Chambord. As an exterior, however, it would probably have at least been equal to the fragment of the court of the Louvre, which was in course of being erected simultaneously and almost in sight of this building, while its open arcades give it exactly that degree of shadow and relief the want of which is so much felt in the Louvre."

It is remarkable that Mr. Fergusson does not mention the peculiarity which rendered the Château de Madrid a novelty to Parisians. It was popularly known as the "Château de Faïence." This was owing to the manner in which glazed terra-cotta was employed in its construction and decoration. Probably Mr. Fergusson did not approve of that mode of construction, which in our time is found to possess many advantages. Philibert Delorme, when he was entrusted with the completion of the building after the death of Francis I., declined to continue the enamel decoration, although he employed it elsewhere. The château must therefore have wanted unity, and resembled a great many English houses, in which we find a difference between the front and the sides. Some fragments may be found in the Sèvres and other museums, which are supposed to have formed part of the château. But it is very doubtful whether any important part survived the merciless destruction to which the structure was condemned, as if it were an enemy of the Revolution. There is one description of the building which should have interest for Englishmen, and which suggests the peculiarity which distinguished it. In 1650 John Evelyn was in Paris, and on April 25 he visited the château. The following record of the impression it made on him is given in his Diary:—"I went out of towne to see Madrid, a palace so call'd, built by Francis the First. 'Tis observable onely for its open manner of architecture, being much of tarraces and galleries one over another to the very roofe, and for the materials, which are most of earth painted like Porcelain or Chinaware, whose colours appeare very fresh, but it is very fragile. There are whole statues and relievos of this potterie, chimney-pieces and columns both within and without. Under the chapell is a chimny in the midst of a roome parted from the Salle des Gardes. The house is fortified with a deepe ditch, and has an admirable vista towards the Bois de Boulogne and River." The palace at that time had existed for about a century and a quarter. But the colors continued to be "very fresh." As to the "fragility," if the pieces were thin, they were likely to be broken after a fall, but the word was likely to be used to suggest that faïence was not considered to be as enduring as brick or marble. Evelyn said that the château was built by Francis I., and was given its name in order that he might be absolved from his oath, "that he would not depart from Madrid, in which he was a prisoner in Spayne, but from whence he made his escape." That may have been the belief among foreigners at the time, but it is not supported by evidence. When Francis I. was taken prisoner at the battle of Pavia in 1525, he demanded that he should be conducted to Madrid to his cousin, Charles V. He found the emperor was not inspired by any excess of generosity. He was treated as a royal prisoner, and was so disappointed he thought of abdicating in favor of his son. At length he signed a treaty which his subjects declined to accept. The Pope released the king from his oath. When Francis began to build the château it was known as the "Château du Bois de Boulogne," or more simply "Château du Bois." People imagined when they saw the enameled exterior that it was an imitation of the Alcazar or the Alhambra. It was even believed that the prison in which the king was confined when in Spain was of a similar character. But so far as is known Francis I. never desired to have a memorial of his misfortunes, and his conscience was not sufficiently scrupulous to compel him to set up a memorial which would remind him that he had broken his oath or was disloyal to Charles V.

The origin of the building was much more commonplace. English visitors when they take drives through the Bois de Boulogne where the palace was erected may imagine from the number of routes, avenues and alleys, which are laid out with so much skill, that the trees also were planted in modern times to give pleasure to spectators. But long ago the Bois formed a part of a genuine forest which extended beyond the suburban towns which now mark its limits. Francis I. was fond of hunting there, and he wished to have a residence which would be nearer to it than the Louvre or St. Germain. There was no doubt that he was a genuine lover of the arts and artists of Italy, and he formed an Italian school which exercised a great influence in France. The king must have often heard of the success of Luca della Robbia in the decoration of buildings by glazed and colored terra-cotta, and it was only what we might expect from such a patron to insist that his new villa, which Pierre Gadier designed, should exemplify the latest novelty in architectural decoration.

Some of Luca's grandnephews were following in his footsteps. The younger Luca apparently confined himself to glazed terra-cotta. But his brother Girolamo not only worked in clay but in marble and bronze. The latter was therefore better adapted to serve Francis I., and through the agency of some Florentine merchants he was persuaded to visit France. Vasari says that he executed various works for King Francis, "more particularly a palace decorated with numerous figures and other ornaments, cut in a kind of stone similar to that which we have ourselves at Volterra, but of a better quality, since it is soft while being worked and becomes indurated by time and exposure to the air." Girolamo labored in other parts of France, and it is said remained in the country for about forty years. He acquired wealth as well as reputation. He invited his brother from France, but Luca died soon after his arrival. Vasari considers that after Girolamo's death the methods of working in glazed terra-cotta became unknown.

Francis I. died in 1547, and at that time the Château de Madrid was not completed. His successor, Henri II., was likewise favorable to the advance of art, and his name is associated with an interesting class of pottery. The works are believed to have been continued under Philibert Delorme, who was also engaged at Fontainebleau, the Tuileries, and other palaces. Henri II. reigned for only twelve years. The château was partly used as a hunting lodge and partly as a residence for royal favorites. But we do not learn that additional works were carried out. There is reason to suppose that the château was neglected. Henri II. set up a menagerie in the grounds, and in the time of Louis XV. it was used like Hampton Court at the present time, to afford accommodation for people who had some claim on the liberality of the Sovereign.

Many of our readers may remember the engraving from Elmore's picture of the invention of the stocking frame. William Lee, who was a Cambridge scholar, is represented watching his wife knitting at the time when he was happily inspired to invent a machine which would serve instead of women's fingers. Hose were then important articles of dress, for they were not concealed by other garments. The great Henri IV., although burdened with the task of reconciling the different sects, made arrangements that the Château de Madrid should be used as a factory for the production of hose under the superintendence of Lee. He was also desirous of introducing various other industries and to reorganize French trade. But the king's assassination by Ravaillac put an end to projects of reform. Lee endeavored to assert his rights, for he had brought over a great many workpeople from England. But the disturbances which followed were unfavorable to his claims. It was remarkable that in the eighteenth century one of the gentlemen who were allowed to live in the château used his apartment for weaving silk stockings. The effort to use the building for a factory must have had an ill effect on the royal residence, and for a long time it could not be said to be applied to any definite use.

Although of little or no utility, the Château de Madrid required the expenditure of money for its upkeep. Louis XVI. was compelled to give an order for its demolition. But it was untouched when the Revolution broke out. It was then sold to two con-

tractors, Borne and Leroi, for the small sum of 8,000*l.* For the lead they were able to obtain more than 6,000*l.* The sculpture in marble and wood was purchased by strangers. The temper of the time is suggested by the fact that no importance was attached to the beautiful work of Girolamo della Robbia. The whole of it was sold to a paviour, and was converted into cement. Whatever might be said about some of the decoration, the walls at least could not be described as fragile. Although demolition in many forms was destined to be supreme during the French Revolution, the housebreakers of that time had to submit to many delays at the Château de Madrid. Large fires were lighted. But as gypsum must have been largely employed in the construction the walls withstood the flames. At length they had to be taken down course by course with pickaxes. So much labor was expended on the work, it is stated that the expense of demolition exceeded the enormous prices received for the materials.

It would be strange if some attempts were not made by Frenchmen to imitate the decoration of the Della Robbias. It was employed on mansions here and there; but they were so few in number that we must conclude that the sixteenth-century architects in France were not favorable to that class of work, although there were ancient as well as Renaissance precedents for its use. It afterward became confined to finials and ornaments for roofs. Of late years the French potters have shown their ability to produce paneling and surface decoration in glazed materials. The discovery of the Persian frieze by M. and Mdme. Dieulafoy, which is now in the Louvre, has doubtless given an impetus to ceramic decoration, for it is a precedent of great age which is well deserving of respect.—*The Architect.*

HEATING APPARATUS.—III.

ALTHOUGH hot-air furnaces supply fresh air as well as warmth, there is a limit beyond which they cannot be successfully operated; and for houses beyond a certain size, as well as for smaller houses, in which economy of fuel, of trouble and of space are desired, even at a sacrifice of fresh air, hot water or steam apparatus must be used. It is true that two furnaces are often employed with success for heating a house too large or too long to be satisfactorily heated with one; but it is troublesome to feed and care for two fires, and where the first expense is not an important consideration the other methods are in some respects preferable.

In many instances hot-water and furnace heating are combined, the furnace itself having a "hot-water attachment," or "combination," consisting of a coil of pipes or small boiler in another form suspended in the dome of the furnace and connected with radiators in the rooms which it is difficult to reach with warm-air pipes, and with an expansion tank in the upper story. Most of the furnace manufacturers supply this "combination," which affords an admirable resource for heating remote or exposed rooms, to which warm air from the furnace air-chamber cannot be successfully conveyed.

While a combination furnace and hot-water heater unites the advantages of both systems, it also unites some of their disadvantages, and many people, even for small houses, prefer a "straight" hot-water apparatus, which comprises only a small, neat boiler in the cellar, easily managed, very economical of fuel, unaffected by the weather, and very durable, in place of the bulky, extravagant and comparatively short-lived furnace, which needs attention at every change of wind. Whether the ventilation afforded by the furnace, which is usually calculated to change the air in the rooms which it supplies about once in fifteen minutes, is worth the additional expense and trouble of maintaining a hot-air furnace, is a question which every house-owner must answer for himself; but much depends upon the habits of the family, the provision of open fireplaces and other circumstances, people who live much out of doors, keep their rooms cool and their windows open at night, and have fireplaces to draw off foul air, being healthy and happy where persons of sedentary habits, afraid of the cold and of draughts, would suffer for want of the fresh, warm air supplied by a furnace.

Most hot-water boilers for house heating are made of cast-iron, those for small houses usually being in one piece, above the firepot, while larger ones are generally made up of sections, vertical or horizontal, according to circumstances. Two systems, as the novelists say, "contend for the mastery" in the construction of hot-water heaters, the "vertical circulation" system and that with "horizontal heating surfaces." It is found that a given quantity of fuel will impart about twice as much heat to water contained in a flat pan above the fire as it will to the same water in a vertical tank at the side of the fire; so that, for economy of fuel, it is desirable to have the flame strike, as far as possible, on the under side of the portions of the heater in which the water is contained. As, however, heated water moves laterally only with some difficulty, the circulation in a heater with a multiplicity of horizontal water surfaces is less active than in one in which the vertical movement of the water, when expanded by heat, is unimpeded. The manufacturers of such apparatus of course understand these principles and endeavor to combine in various ways the free circulation of vertical water-tubes or sections with the superior efficiency of horizontal heating surfaces.

Although the expense is slightly greater, it is desirable, for small houses, to give every radiator an independent flow and return pipe from the boiler. As the pipes for this purpose are small, the difference in cost between this system and one employing fewer but larger pipes, branching to the radiators, is insignificant, and it is a great advantage to be certain that every radiator will circulate to its full capacity, independent of any other, as well as to be able, by adjusting the valves, to equalize the heat among the various radiators or to cut out entirely any radiator in case of need. In larger houses it is impracticable to give every radiator a separate flow and return to the boiler, as the latter would not have room enough for the necessary connections; but an approach to this system can generally be made, with a little ingenuity. In general, where many radiators are to be supplied, the best results will be obtained by "downward feeding," carrying one or two main flow-pipes, without branches, directly to the top of the building, opening there into a large horizontal main, from which pipes are brought down in any desired number, supplying the various radiators on the way. By this arrangement the cooling of the water in the radiators and pipes hastens its downward flow and quickens the circulation, and there is little liability to the uneven distribution and the stoppages from dips and air-traps which can hardly be avoided with the ordinary system.

Heating contractors generally utter what the Frenchmen call "loud cries" when such a system of piping is proposed to them, protesting against the "extravagance" of sending the hottest water in the boiler to waste its heat in the roof instead of utilizing it where it is needed; but the architect need not concern himself about their remonstrances, which are generally inspired by the consideration that the piping is somewhat more expensive in this system. The results, however, fully justify the extra cost. It is easy to cover the pipes in the upper story with asbestos or magnesia, if they give out too much heat; and, as the water will undoubtedly be hotter at the top of the building than in the lower stories, the radiators in the upper rooms should be made proportionately smaller. With these precautions, the superiority of the "downward-feed" system over the ordinary one is so great that the architect who has once used it will always prefer it where it is practicable.

Even for steam, especially with the low-pressure steam from house boilers, a similar downward circulation, secured by carrying up the main steampipe without branches to a horizontal main in the highest point in the building and bringing pipes down from this to supply the radiators, has great advantages. Not only is the circulation, as in the case of hot water, more rapid and less liable to checks or irregularities, but, as the steam and the condensed water, except in the large main riser, always flow in the same direction, there is no liability to the "hammering," due to collisions of steam and condensed water in a small pipe, which is so common in badly planned steam systems.

In inspecting steam or hot-water piping the architect should satisfy himself in regard to a few essential points, even if he can trust the contractor in regard to the others. Most hot-water heating systems in this country are arranged on what is called the "open-tank" system, the system of piping including at its highest point an "expansion tank," generally a cylinder of galvanized-iron holding ten or twelve gallons and covered loosely to keep out dust. Fresh supplies of water are poured into the piping through this tank, and any bubbles of steam or air that may form in any part of

the system escape through it. As this expansion tank affords virtually the only practicable safety-valve for a hot-water heating system, the communication between the boiler and the tank, or between the boiler and the highest radiator, from which the expansion pipe may sometimes be carried, must always remain open. There should not even be a valve on it, for valves are sometimes closed through carelessness or ignorance, and the cutting off in this way of means of escape of steam from the boiler, if any should be formed, may cause dangerous explosions.

In steam piping an important point is to see that all return pipes are "trapped" by bringing them down into a main horizontal return below the water-level of the boiler. If this is not done, steam will endeavor to enter the radiator through both the steam and return pipes, and the circulation will be defective. Where the "one-pipe" system is used, the same pipe accommodating both the steam and the return water, trapping the returns is, of course, impracticable; but it is in this case unnecessary, as the pipes are large enough to give room for air, steam and water to circulate without mutual interference. In heating work, both with steam and hot water, it is often useful to remember that a given amount of radiating surface, in the form of horizontal pipes, or "coils," or "circulations," as the steam-fitters call them, will be about twice as effective in warming a room as the same amount of surface in the ordinary vertical-tube radiators. The reason of this is that the air, in rising, as it expands past the horizontal coils, is checked and held longer in contact with the hot surface than when it simply brushes by a vertical tube. Perhaps this circumstance may afford a suggestion to that long-looked-for genius who is to design a radiator which a person of æsthetic sensitiveness can contemplate without a shudder. Of the patterns now in use, the so-called "art" varieties are not only the most hideous, but often the worst heaters. The simplest "vertical tube" radiators are the least offensive, and for steam the old variety, known as the "Clogston" radiator, in which all the pipes are covered with flanges, or "gills," while entirely devoid of any pretension to beauty, is tolerable on account of its simplicity, and by the extension of its radiating surface gives off a modified, though abundant, heat, which is unusually agreeable.

Where indirect radiation is used for all or a part of the heating, æsthetic considerations give place, of course, to those of efficiency. The piping of indirect radiators is similar to that for direct radiators, but the pipes are usually shorter and the steam system more manageable.

After the piping is properly arranged, the care of a steam or hot-water boiler is a comparatively simple matter. Most house boilers, both for hot-water and steam, are fitted with some form of triangular-bar grate, and, as the fire is steadied by the surrounding mass of water, it is not liable to the sudden and violent variations which are so harmful to furnaces.

Steam boilers for house-heating are generally larger affairs than the hot-water boilers, for the reason, probably, that hot water has, to a great extent, superseded steam for heating small houses, as being more manageable and more economical. For very large houses, however, steam affords certain advantages over hot water, the pipes required being smaller and the heat at points remote from the boiler being more quickly available. House-heating steam boilers, except in rare instances, where, for example, steam is brought from a boiler-house outside, are now of the sectional type, sometimes of cast and sometimes of wrought iron. Naturally the wrought-iron boilers, which are made up of tubes of enormous strength are desirable where any considerable pressure is to be carried, and are often used for low pressures; but, as the ordinary pressure in house-heating boilers is only about two pounds to the square inch and is usually limited by the safety-valve to a maximum of ten pounds, cast-iron can safely be used to resist it; and the great majority of house-heating steam boilers are of cast-iron, often with an addition of wrought-iron "drop-tubes," or wrought tubing in other places, to increase the heating surface, as well, sometimes, as to add to the strength.

Whatever the construction, every boiler used for steam should have a pressure gauge, and a water column to show the height of water in the boiler, and a safety-valve. It is hardly conceivable that any contractor would leave out any of these indispensable fittings, but, as a matter of fact, even the safety-valve is sometimes left out in a cheap job, the contractor apparently calculating on the speedy removal of his customers from this weary world to save him from trouble on account of the omission.

THE GREEK GOVERNMENT AND EXCAVATIONS.

IT should be noted that the Greek Government does not allow any antiquities to leave Greece. It is upon this condition that permission to make excavations is granted, and a single instance of infringing this law would *ipso facto* annul the concession, although foreign savans before beginning operations are obliged to purchase outright from Greek subjects the land where they intend to dig. Moreover, the Greek Government does not contribute a drachma toward the excavations in Delos, which are carried on in a moist, feverish soil, where two-thirds of the laborers are frequently down with malaria. The cost is mainly defrayed by the liberality of the Duke of Loubat, to which is added a small annual subsidy from the French Government.

The Greek law prohibiting the exportation of antiquities is, after all, a necessity, for almost all of the finest, and certainly the greater number of the works of art of ancient Greece, have been destroyed by the Turks or are to be found in the museums of Europe. The Elgin marbles, comprising the best part of the friezes of the Parthenon, are among the most important works that left Greece, but Lord Elgin did Greece a good turn by taking them away; otherwise they would have probably been destroyed by the Turkish soldiers. The French Government recently sought to obtain a concession of the Greek antiquities found by the School of Athens, at Delphi and at Delos, with the object of placing them in the Louvre, but finding that this could not be accomplished, the French Ministry of Public Instruction and Fine Arts has decided to found a museum of its own in Delos, where, owing to French enterprise and American money, the ancient town and seaport have already been excavated, thereby bringing to light streets, dwelling houses, market places, monuments, theaters, statuary, mosaics, columns, frescoes, jewels, inscriptions, pottery (domestic and decorative), tablets and cooking utensils, which give with unprecedented accuracy complete insight into the every-day life of this antique and sacred city.

Analagous excavations in the lava fields of Vesuvius enabled science to reconstitute a typical town of the later Roman period. Between Pompeii and Delos there is a striking parallel. Owing to the magnificent results that have thus rewarded the efforts of the French School of Athens at the very outset of their labors at Delos, Apollo's sacred island bids fair to become as fertile in monuments and dwellings of an Hellenic city during the fourth century, B. C., as was the famous town of the Campania in supplying relics of the domestic life of the Romans in the first century, A. D. The present "finds" have given a tremendous impetus to the work. It is greatly to be regretted, however, that the cast-iron conservatism and dry-as-dust traditions of the French Academy do not permit any photographs of the Delos discoveries to be published until that venerable but slowly moving institution has itself utilized them in its ponderous reports, the appearance of which is often delayed for months, or even years.—C. I. B., in *New York Tribune.*

SOME DANGERS OF JOINERY.

ALTHOUGH the occupation of a joiner cannot be classed under the head of dangerous trades, his life is a short one, the average being not more than forty-five years; and in the case of the joiner continually in a shop much less, a fact easily proved by referring to death statistics published annually by the various trades unions in the woodworking industries. Doubtless this mortality is due mainly, if not entirely, to the nature of the calling. The diseases from which joiners suffer most —especially such as are constantly working on hard woods—are consumption and asthma, both of which are contracted through inhalation of the fine dust arising from and kept in circulation by the use of glass paper, noticeable more particularly with hand-rail hands, and especially with mahogany rails. A joiner working on such is scarcely ever free from symptoms of colds, being, from the nature of his work, compelled to bend closely over same, contracting the muscles of the chest, and thereby accentuating the evils arising from the inhalation of the dust, which in some cases is undoubtedly poisonous, and more especially so from the best qualities of mahogany, such as Spanish or Cuban, the pores of which are filled with a white chalky substance: this matter is not found in mahogany of the common sort.

Teak is another of the hard woods from which a joiner is liable to suffer, and to him it is one of the most objectionable of woods, containing, as it does, such a quantity of grit and iron, making it

very hard and costly to work, taking at least double the time of any other of the hard woods, never repaying the cost of labor bestowed, besides the enormous wear it entails on the joiner's tools, the up-keep of which is a serious item to him. Another and a more serious objection is that, owing to a poisonous acid contained in teak, it is only on very rare occasions the joiner comes out of his job without some poisoned wound caused by splinters or cuts, and there is no doubt that this acid is of a very virulent nature. It is owing to its presence that teak is so largely used in good-class stable fittings, as it is well known that horses leave it severely alone after one or two attempts at gnawing. Men who are constantly engaged in working it are at times subject to a dangerous skin disease, and cases are by no means uncommon where men have become so permeated with the complaint that the finger nails have rotted away and paralysis has set in, supposed to be due only to the constant handling of this wood.—*W Young in "The Builders' Journal."*

COLORING CONCRETE.

THE incorporation of pigments in the concrete manufacture has not always been successful. It has often been overdone, the colors being too virulent and the work becomes streaky and discolored from the effects of rain and soot, while the colors often fade or discolor after a short period. The first two difficulties are overcome by the exercise of just a little common sense and care, and are not traceable to inherent defects in the pigment. The last trouble, however, is caused by using an unsuitable pigment. There is lime in Portland cement, which we all know destroys or seriously affects the color of many pigments; others do not weather well. Of course, it is obviously foolish to expect a vegetable pigment to be of any service; if not destroyed by the cement, it will quickly lose its color in the open air. The chemical action of the cement in setting is one which will affect all pigments, except those which are inert, basic or alkaline. The oxides of iron are, on the whole, cheapest and most preferable. They should be obtained from a reliable manufacturer. Abroad, especially in Germany, Belgium and Scandinavia, artificial stone in various colors is largely manufactured, and also Dutch tiles and glazed roofing tiles are made with Portland cement colored. In Italy, of course, the practice of coloring cement concrete has been practised for centuries. The importance of the industry abroad has led manufacturers to lay themselves out specially to manufacture colors suitable for the purpose.—*Builders' Journal.*

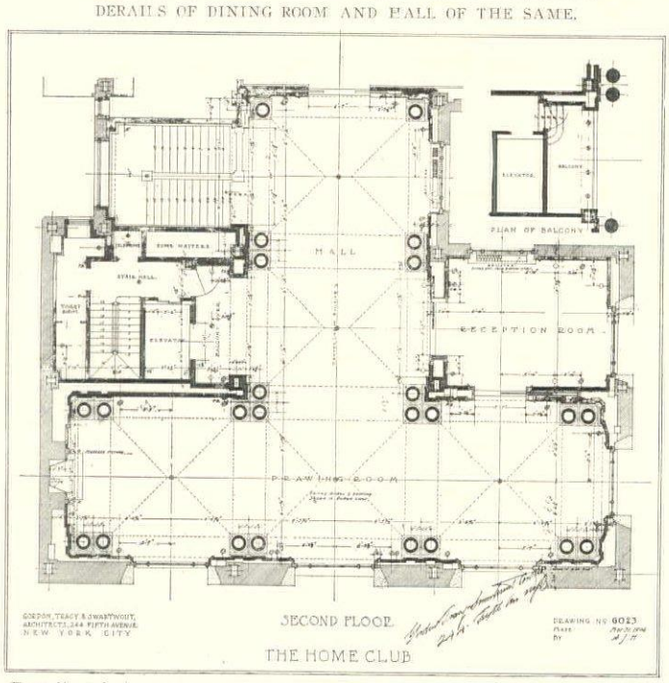
ILLUSTRATIONS

THE HOME CLUB; 11-15 EAST 45TH ST., NEW YORK, N. Y. MESSRS. GORDON, TRACY & SWARTOUT, ARCHITECTS.

PLAN OF FIRST FLOOR OF THE SAME.

PLAN AND ELEVATIONS OF DINING HALL OF THE SAME.

DERAILS OF DINING ROOM AND HALL OF THE SAME.



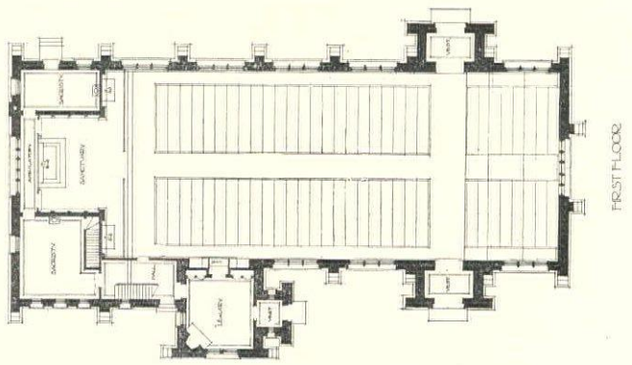
Details of the stone and terra-cotta work on the interesting building will appear in a later issue.

HOUSE OF MAJOR R. DICKINSON JEWETT, WASHINGTON, D. C. MESSRS. MARSH & PETER, ARCHITECTS.

ENTRANCE OF THE SAME.

ROMAN CATHOLIC CHAPEL, STATE HOSPITAL, POUGHKEEPSIE, N. Y. MESSRS. ELLIOTT LYNCH AND W. H. ORCHARD, ARCHITECTS.

ELEVATIONS AND SECTIONS OF THE SAME



Plan of Roman Catholic Chapel, Poughkeepsie, N. Y.

Additional Illustrations in the International Edition.

HOUSE OF MAJOR R. DICKINSON JEWETT, WASHINGTON, D. C. MESSRS MARSH & PETER, ARCHITECTS.

NOTES AND CLIPPINGS

CARILLONS.—To the town of Alost, in Flanders, is credited the use of the first carillon, erected in the year 1487. Shortly before the Reformation the use of the machine was greatly extended, and in the seventeenth century carillons were to be found in all the principal Belgian towns. It may have been due to the close political relationship, at this time, between France and Scotland, that the first appearance of the carillon machine in Great Britain was in the cities of Edinburgh and Perth toward the close of the seventeenth century. In England "ringing" held sway, and it was in but few places that automatic tune playing was introduced. It was not until the year 1868 that any serious attempt was made to construct bell-ringing machinery designed on scientific and harmonic lines, and it was singularly appropriate that the first tower selected for the experiment should have been that of the far-famed St. Botolph's Church, Boston, Lincolnshire. Designed after the tower of Antwerp Cathedral—to which it is but little inferior—the famous "Boston Stump," of a height of 365 feet, stands like a sentinel on the shores of the German ocean. Its surroundings even, the English fen district, have their counterpart in the "low country" of Antwerp. Within this tower no fewer than 44 bells were installed, and a carillon machine was decided upon. The committee, after careful investigation and criticism of the Continental system, called upon Messrs. Gillett and Johnston to construct a machine to play upon the bells.

A NOTE ON THOMAS HARDY.—In a "Real Conversation" with Mr. William Archer, Mr. Thomas Hardy, the novelist, has said that when he was an architect's pupil, he used to be sent round to sketch village churches as a preliminary to their restoration—which mostly meant destruction. "I feel very remorseful now," he says, "but, after all, it wasn't my fault—I was only obeying orders." It is this remorse, perhaps, that has tempted Mr. Hardy to propose that a tower be added to Holy Trinity Church, Dorchester, and present the rector with a design for it. Mr. Hardy, at sixteen, was articled to an ecclesiastical architect in the very place he is seeking to beautify. His time up, he migrated to London, where he worked first under the late Sir Arthur Blomfield (with whom he had a good grounding in Gothic), following afterwards in the wake of Scott, Butterfield, Street, and the other Gothicists. Forty-three years ago he won the Tite prize, and also an Institute essay prize "On Colored Brick and Terra Cotta Architecture." After that he began to drift from architecture into literature.

The American Architect and Building News.

Vol. XC. SATURDAY OCTOBER 27, 1906. No. 1609.

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IN the two hundred-odd towns where the United States Civil Service Commission maintains examiners, there will be held on November 20 and the two days following examinations to secure "eligibles" from whom may be selected the seventy draughtsmen whom it is now necessary to add to the force employed in the office of the Supervising Architect. It may not generally be known that, although the Civil Service Commission has its headquarters at Washington, there are in most States anywhere from three to nine towns where examinations are held synchronously with those at Washington, and that, so, it is comparatively easy for anyone who desires a place on the eligible list to undergo the test. Curiously enough, no examination is held in New York City, those in that neighborhood who incline to endure the test having to take the trouble to cross the river to the neighboring Borough of Brooklyn, and the same may be said of draughtsmen who hail from New Jersey and Delaware. Information as to the whereabouts of the nearest examining town can be had on application to headquarters at Washington, or, presumptively, at the local post-office. It may prevent disappointment in the case of some ambitious "co-ed.," if we explain that only male draughtsmen are desired.

TWELVE of the vacancies are to be filled by engineering draughtsmen of one kind or another, at salaries ranging from $1,200 to $1,800 per year. Of the remainder, twenty places for architectural draughtsmen command salaries of $1,400 to $1,800, while thirty-eight places are open to "junior architectural draughtsmen," at $840 to $1,200 per year. From this it will be seen that the Government cannot be considered as very seriously competing for the best there is in the market, for, though the salaries named are fair, they fall somewhat below what would be paid in private offices of the first class for service of the same description. Still, considering the hours, the vacation on full pay, sick-leave, and so on, a place in the Supervising Architect's office has its attractions, and the opportunities for solid training it offers nowadays are so vastly different from what they were a dozen years ago that no draughtsman need feel he is making a sacrifice if he chance to find himself finally selected from the list of eligibles.

THE disorganization and reduction of force in the Supervising Architect's office that was brought about two or three years ago through the unwillingness of Speaker Cannon to allow the passage of any appropriation bills for new buildings, and the rehabilitation which is now taking place, draw attention once more to the regrettable fact that nothing has been done as yet to bring the Government into regular automatic connection with the best architectural capacity the country produces, and it is strongly our opinion that in matters of art the country should be able to command the services of the best talent there is. It would seem to be not over-difficult to arrange some way by which the Government might profit, automatically, as we express it, by the skill and experience possessed by the returning "travelling scholars" who are now becoming so numerous, and we believe that many of them would willingly delay for two or three years their entry on private practice if they could have some specially recognized position in the Government employ. Perhaps the better way, since it would imply a closer bond and a longer term of service, would be to take up the German experiment and send as "architectural attaches" to the several embassies, for a couple of years or so, the most promising and deserving of the men in the Supervising Architect's office, on the understanding that they shall continue to serve the Government on their return for a stated number of years.

MR. R. SHECKLETON BALFOUR, in his annual address as President of the Architectural Association, which was largely devoted to a rehearsing of the undertakings of the Association as an educational body, took occasion to express his regret that the Association continued to deny the privilege of its classes to those female students of architecture who were desirous of entering them, and voiced his surprise that the younger and more progressive body—as it always asserts itself to be—should be, in this particular, so much more conservative than the Royal Institute of British Architects, which, some years ago, opened its doors to female practitioners. We cannot guess whether the fact that Mr. Balfour is a bachelor has or has not any bearing on his views, but he seems to be convinced that women have made up their minds to enter the architectural field and that, since they show a determination to be helpers, it is only the part of wisdom to educate them into being as efficient helpers as possible. On one point he gives significant testimony, for he says his inquiries satisfy him that where female draughtsmen are employed side by side with males, "more steady work is the result, and that the beneficial restraint that a woman's presence commands has elevated the tone" of those offices where they are employed. Socially and

Entered at the Post-Office at New York as second-class matter.

morally, this is a desirable result to attain, but employers are more concerned with the quality of work their draughtsmen can produce than with the manners and morals of the producers. Fortunately, there is abundant proof of the capacity of women as professional aids.

ALTHOUGH several of the American schools of architecture are already conducted on the "open-shop" principle, so far as sex is concerned, we do not know that any of them, or either brand of student, is particularly anxious to foster co-education; but they are open-minded and willing to do their share, seeing that as yet no school of architecture for women exclusively has been established. Recently, however, an experiment has been begun that may result in the upbuilding of such an exclusive woman's school. The Mary Morrison Carnegie School for Women, at Pittsburgh, has made an arrangement with the Carnegie Technical Schools by which those of its pupils who wish to study architecture may do so. The arrangement seems to be patterned upon that which exists between Harvard University and Radcliffe College, for the women will work by themselves in their own buildings, where Professor Hornbostel and his assistants will repeat the lectures and other instruction already given in the neighboring institution.

A SCHOOL which in the last fourteen years has fitted over four thousand young women to earn a living as designers in one or another of the occupations that depend upon the applied arts surely deserves to be countenanced by all intelligent persons, and on merely general principles it would give us pleasure to add our own applause. But we find that the New York School of Applied Design for Women, at 200 West Twenty-third Street, has a particular claim to our consideration, since we find that it maintains a Department of Architecture and Decoration, under the direction of Mr. Harvey W. Corbett, architect, which undertakes to prepare young women for "the work of the architect's draughtsman, which position women fill, with practical training, fully as well as men." We might grant even more than this, seeing that the average value of the masculine draughtsman is not very exalted. We apprehend that the school is largely intended for those young women to whom the co-educational methods at the Cooper's Union and similar places are rather offensive, an inference that is helped by the location of this school at the very center of the fashionable shopping-district.

THE diplomatic controversy between this country and Japan, which seems on the point of breaking out because Japanese children have been excluded from certain California schools, leads us to turn with interest to the Commissioner of Labor's third report on Hawaii, which, to a considerable extent, is devoted to statistical information as to the degree and manner in which the accretion of Asiatic labor in the Sandwich Islands is prejudicial to the best interests of the Americans there and the development of American ideals. A cursory examination of the report, which does not particularly concern us, shows that the matter of Asiatic underrunning of the labor market is one of considerable importance to the white mechanic, who now finds that his early good-natured willingness to employ and train Japanese helpers was a mistake, since it has produced a small army of Japanese mechanics sufficiently skilled in American methods to seek work now for their own hands at "cut rates." The Commissioner quotes, with seeming approbation, the remark of one American mechanic who declared that the islands were "really a sort of kindergarten for Japanese mechanics." The way the Japanese mechanic is driving out the American is shown in exemplary fashion by the fact that seven firms who in 1901 gave employment to one hundred and sixty Americans employed in 1905 only forty-three. At present there is a feeling that Americans can hold their own against Japanese employers and their Japanese workmen, but that the case is different when they have to compete with an American contractor who employs Japanese workmen. This point is supported by various statistics: for example, in the case of a certain dwelling-house the bids ranged from $8,200, from an American contractor employing white mechanics, to $6,050, from an American contractor employing Japanese workmen, the bids from three all-Asiatic forces ranging from $6,300 to $6,100, the bid from Chinamen, oddly enough, forming the middle term between those of two Japanese competitors.

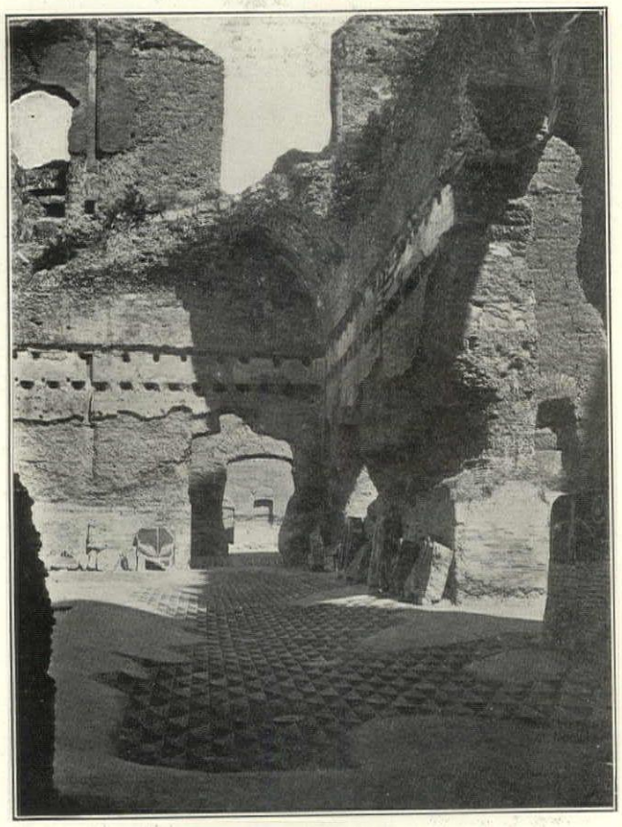
IT is good news that the unmanly practice of boycotting has, in one instance at least, caused the union that practised it to lose a good deal of money, although satisfaction is lessened by knowing that the eight-hundred-odd dollars paid into court by the Building Trades Council of Wilkes-Barre, Pa., was exacted as costs and dues for contempt of court, rather than as a fine for breach of the laws of decency and fair play. The Council in question declared, five years ago, a boycott against Patterson & Co., of Wilkes-Barre, on the ground that they maintained an "open shop," and enforced it by ordering strikes on all buildings to which Patterson & Co. delivered any lumber. Naturally, a writ of injunction was sued out, and almost as naturally it was disregarded. Seeing this was the case, the Building Trades Council, through its officers, was brought into court for contempt, and after a bitter fight was adjudged guilty. Appealing to the Superior Court, it met no better fate, and at last has had to pay a considerable sum, and, worse than that, from its own point of view, has lost prestige in the world of uniondom.

WHEN an English writer on art does not know what else to say he turns to Alfred Stevens—the English sculptor, not the Belgian painter—and, as the Wellington monument is rather a threadbare text, he is likely to fall back on the big-little lions that Stevens modelled for the pickets of the fence about the British Museum. Where these masterly little beasts—in spite of their conventionalization, every whit as full of life as the best of Barye's more naturalistic figures—have been hidden since the British Museum fence was taken down, a dozen years ago, we do not know, but someone with interest in the building now suggests that the discarded railing should be erected about the Tate Gallery, where the lions at least would be in good company with those other British "lions" hanging on the walls within.

THE ARTISTIC PAVEMENTS OF ITALY.—I.

ARTISTIC Italy at every stage of its history possessed pavements which are worth studying to-day, when the decorative arts are arousing from their long sleep. Roman antiquity, not less than the Middle Ages, interests the student of artistic pavements, and far more than the periods which followed. So to-day I shall speak mainly of the mosaic-works that belong to Latin and Mediæval times, the latter extending from Byzantine to Gothic work, halting at that period of transition into the Romanesque, or Lombard, work which offers buildings that are often decorated with very artistic pavements.

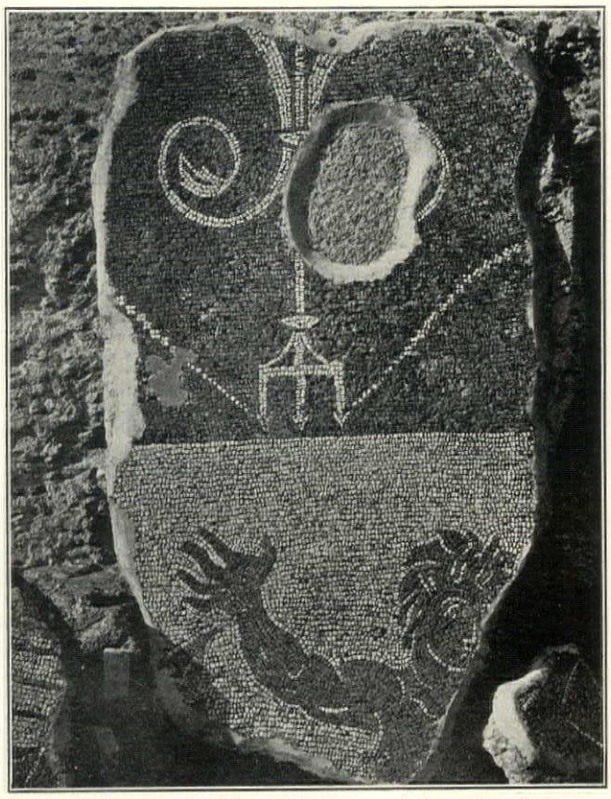
The Latins were the offspring of the Etruscans and the Greeks, particularly of the latter, who, through their genius, triumphed over that of the Etruscans, and if anyone should ask me whether the Greeks had artistic pavements, I would answer that the people who created the Parthenon and the chryselephantine figure of Athena, by Phidias, and for whom Polygnotus painted pictures did possess pavements, and that the joyous story of these has been preserved by history. History in this case speaks with the voice of Pliny, who informs us that there existed at Pergamos a pavement that depicted, fragmentarily, a banquet, revealing bits of salad, peas, nuts and meats, a superb piece of work by a



THE BATHS OF CARACALLA, ROME.

master mosaic-worker, a certain Soso. This pavement must have belonged to the celebrated composition known as the "Doves of Pliny" in the Capitoline Museum, Rome, wherein are seen four pigeons perched on the lip of a basin, three simply gazing curiously about while the fourth admires his own reflection in the water.

Surprise increases, if we pass from this Hellenic to the Hellenistic or Alexandrine period in our attempt to draw near to Latin work, before we turn to the consideration of the Mediæval work that most concerns us. In fact, Pompeii, city sacred to Hellenistic art, contains the remains of the finest antique pavement that has been preserved to us, the "Battle of the Issus"; in short, between Alexander and Darius III., King of Persia, a mosaic discovered in the "House of the Faun," but now transferred to the Naples Museum. Its author, not less than Soso (in fact, it might be that Soso himself executed it, since, according to Pliny, he exercised his art in Italy), not less than the Greek mosaic-worker, has now the enthusiastic applause of posterity, and it is lamentable that he must remain nameless. Yet, for my part, I do not look with entire favor on the introduction of human figures into pavements. The human decorative sense seems to be offended by such a use, and Art should not humiliate the most beautiful thing that exists in Nature, the human image. I rather prefer the fragments of mosaic paving that have been found in



FRAGMENT OF PAVEMENT FROM THE BATHS OF CARACALLA.

Sicily, designs that are based on interlacements in imitation of tissues and drawing their inspiration from the cloths that the people anterior to the Greeks of Sicily adopted for hangings.

FRAGMENT OF PAVEMENT FROM THE BATHS OF CARACALLA.

There is no doubt that antiquity had pavements that imitated carpets, for there have been discovered fragments of mosaic pave-

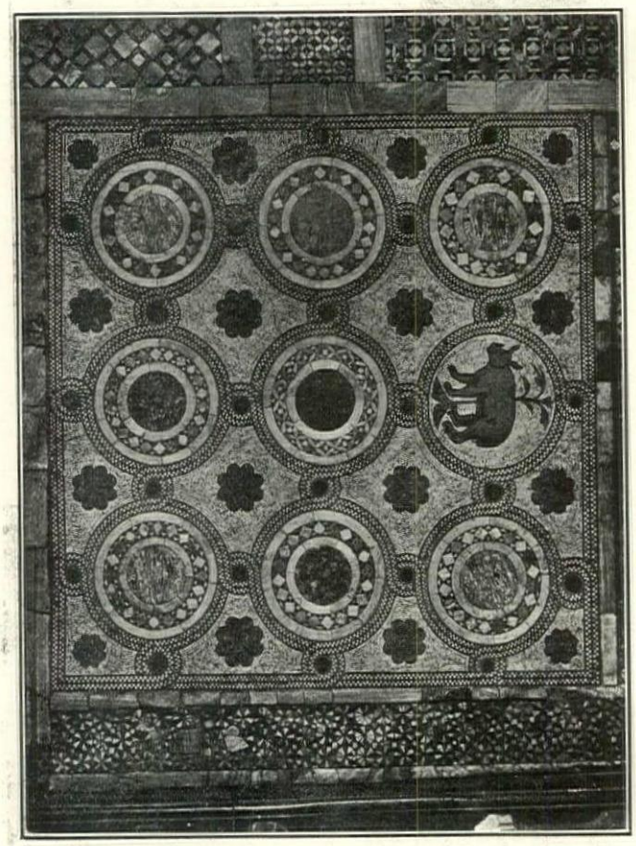
ment that evidently drew their inspiration from tapestry. Little by little, to such ornaments were added the figures of men and animals, of the gods even, and historical scenes, as the "Battle of the Issus" proves.

Classic art must have enjoyed a perfected technique to be able to execute such designs in pavements; in fact, the Greeks and Latins did not recognize any difficulties and their systems went by different names which identified the material and the methods to be adopted. Thus there was the *"opus tesselatum,"* the *"opus vermiculatum,"* and the *"opus sectile,"* names which each indicate a different method of execution which changed according to the character of the design to be reproduced.

The *"opus tesselatum"* indicates more particularly mosaics built up with little square bits (*tesselæ* or *tesseræ*) of colored stone so as to form geometric patterns.

The *"opus vermiculatum"* applies to work where the mosaic is built up with bits of stone having curved outlines, and hence is especially adapted for use where leaves and flower-forms or animate figures are introduced—forms, that is, which cannot be done in the *"opus tesselatum."*

I will add that the following words or expressions, *"museum," "musivum," "opus musivum,"* which contain the etymological



DETAIL OF MOSAIC PAVEMENT, S. MARK'S, VENICE.

norm of the Italian word *"mosaico,"* relate to work where, instead of stone cubes, bits of glass and enamel are used.

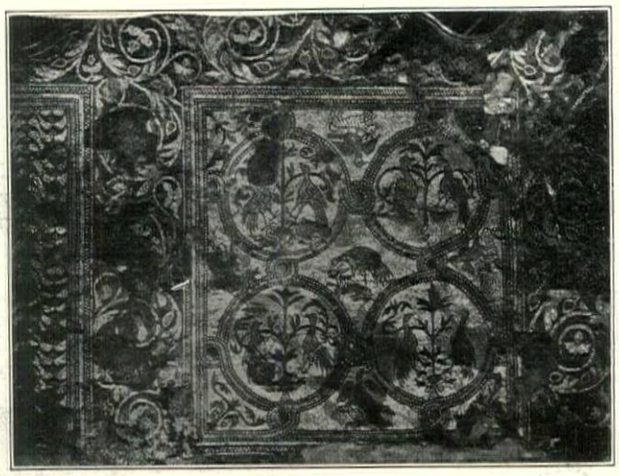
This is rather in opposition to the old prejudice, according to which Classic antiquity only knew of marble mosaics. In reality Rome, from the first century, used enamels in mosaic-work, a fashion that prevailed up to the times of the emperors.

After having named one other term common to the language of mosaics, the *"Alexandrinum opus,"* a kind of "sectile" mosaic in two colors, black and white on a red ground, for example, I will turn more directly to considering examples of artistic pavements.

I should never finish with Latin pavements. I could not easily reach the end if I tried to enumerate merely the most remarkable types that are to be found at Rome and Pompeii; the types are numberless and offer divers opportunities of classification.

The class which interests us more is the pavement decorated with images or ornamental designs, and also that where both kinds of ornamentation are combined. To the first type belongs the pavement in a convent at Tuscolo, near Frascati, a very peculiar one that represents a palæstra where a number of naked men are engaged in sports. I have reproduced this fragment in my *"Ornamenti nell' Architettura,"* where, too, the reader will find a similar, but not so curious, fragment from an apse of the Baths of Caracalla, decorated with athletes, some nude, some simply busts like gaines, as shown in the illustration.

Whoever would increase his knowledge of Latin pavements should journey to Rome and Naples. There, especially in the Vatican Museum and in the Museo Nazionale, and now and then

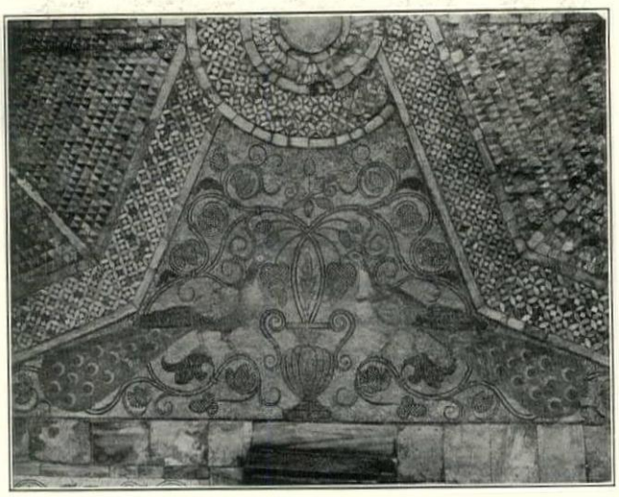


DETAIL OF MOSAIC PAVEMENT, S. MARK'S, VENICE.

elsewhere, he will come upon pavements decorated with leaves and flowers, circles, squares, heads, figures scattered over the surface in themes and motifs of decoration where, often, are encountered friezes ornamented with Greek frets, interlacements or scrollwork.

And now I wish to conduct my readers to the paleo-Christian mosaics that parallel the artistic creations of imperial Rome: these perfectly prepare the way to a knowledge of the pavements which constitute one interesting side of the artistic patrimony of the Italian Middle Ages. But the quantity is modest: the early Christians led the same artistic life as their Roman contemporaries. Whoever goes to Pompeii or visits the cemeteries of Rome and Naples is surprised by the expression of thought and religious feeling in the art work of the early Christians, work which corresponds with the art of the Roman decadence. The quantity is small, as I said, and if I mention the mosaic pavement in the cemetery of SS. Marcellin and Pietro, or of Sant' Elena at Rome, it will be enough to serve as a specimen of paleo-Christian art.

Christian art having gathered strength with the triumph of Byzantinism, the thought at once wings to Ravenna and Venice,



DETAIL OF MOSAIC PAVEMENT, S. MARK'S, VENICE.

which offer their luminous pages, superb pages which recall cherished memories rather than actually place before us seductive realities. If all still had an existence, then we could admire to-day the pavement in S. Giovanni at Ravenna depicting a storm-tossed sea: ordered by Galla Placidia in 427, in memory of a perilous escape from the waters of the Adriatic, it recalled another pavement which, if it too existed, would not leave unmoved him who

passed over the pavement of Sta. Sophia: this represented the four rivers of Paradise flowing from the cardinal points, enlivened with the beasts and fishes native of the stream, and must have been very picturesque at least.

Thanks to the Archæological Society of Parenzo which has sent me the drawing, I can speak of the pavement which extends through that famous basilica, the cathedral of this Italian, though politically Austrian, city, which in style and epoch (VI. century) recalls the Byzantine monuments of Ravenna. It is a pavement that does not belong to solemn presentations, so far as one can judge: it belongs rather to the ornamental and geometric, and so is allied to the Latin tradition.

There is preserved to us in relatively good condition in the pavement of S. Mark's at Venice one of the most remarkable of pavements. But does it really date back quite so far as is asserted, this chef d'œuvre of the mosaic worker? Let us see. The pavement of S. Mark's cannot have been due to a single inspiration. On the contrary, one might consider it a vast and beautiful "specimen" of motives which, though actually carried out in S. Mark's, were intended for another monument. What suggests this idea is the fact that certain sides do not correspond to the sides of the pilasters—have no connection with the lines of the domes. One cannot be sure that this dedication to irregularity, as my friend Professor Goodyear would call it, was an architectural fault or a bit of negligence, rare in the Middle Ages. In the Middle Ages I comprehend the mystery of these irregularities, but what strikes the eye, as I have remarked, is the very large, almost inconceivable, variety of ornamental ideas, and this seems to justify the notion I have conceived as to the purpose of the pavement of S. Mark's.

In this way I confirm what I have said elsewhere, to wit, that certain portions of the present pavement cannot have belonged to the primitive church of S. Mark founded by the Partecipazi and finished in 883, or to the church as restored, after a great fire, by the order of Orseolo I. between 976 and 978. I believe, in short, that the ancient Church of S. Mark, which corresponds to about half of the present one, had an artistic pravement, all the more that it was customary at Venice then to so embellish the churches, as is chown by the abbey church of S. Ilario, which in date (820) about corresponds with S. Mark of the Partecipazi. This being admitted, it is easy to understand how the present pavement contains bits anterior to the epoch when this present pavement was composed as it now is, that is to say, in the time of the Doge Domenico Contarini (1070).

Frequent restorations (and as a rule restorations are an insult to the original) succeeded at length in altering the signification of the pavement of S. Mark's (and the records of these restorations run back to the fifteenth century), and do not contribute to the integrity of the monument. It would be worth one's while to turn to the critical account which Signor A. Zorzi dedicates to John Ruskin of certain restorations of the pavement, the most recently restored portions of which are the passageway leading to the staircase near the chapel of S. Pietro and that before the door of S. Clemente, and in the atrium about the tomb erected to the honor of the Doge Falieri. Remarkable restorations are now (1906) being carried out at S. Mark's, and amongst other things the curiously undulating pavement is receiving attention.

(*To be continued.*)

ALFREDO MELANI.

PIERRE-PAUL PUGET.

A FEW days ago Marseilles was rejoicing over the inauguration of a statue of the famous sculptor, Pierre-Paul Puget, whom it claims as a son. It is never very difficult to create excitement in the southern seaport, and to make much ado about nothing. But in this case there was good reason, for Puget was a man of whom France as well as Marseilles should be proud. The ministers who attended and who delivered speeches were only expressing the national opinion in their eulogies.

Puget was born at Marseilles in 1622, or, as M. Lagrange asserts, at Séon, near the city. In those days artists did not confine themselves to one branch of art, and his father was described as an architect as well as a sculptor, but was not successful in gaining a reputation in either art. We are afraid it cannot be said he was an affectionate father, for he got rid of his son when the boy was fourteen and apprenticed him to a sculptor, who seems to have been employed mainly in the production of figure-heads for ships, and who also appears to have designed vessels. Young Puget soon distinguished himself. He was, however, restless, and having heard some of his companions talk about the great artists of Italy, he resolved to go there. In other words, he ran away from his master, and in his fifteenth year he found himself penniless in Florence. He obtained employment with a wood-carver and again displayed his ability. But he was tired of Florence in about a year and then went to Rome. There he found a kindred spirit in Berettini, who is better known as Pietro da Cortona. He was one of the prominent men in a period of decadence in Italian art. He was not without ability, but all his efforts were directed to produce startling effects in color and composition. He was about the last man who was fitted to instruct a young sculptor. But Puget at the time had no settled purpose, and his highest ambition was to imitate the master as a painter. From the effect of Berettini's influence Puget was never able to emancipate himself.

After three years Puget returned to Marseilles, and as he could paint as well as carve and design it was not difficult for him to find employment. The Duc de Brezé was then Grand Admiral of France. He heard of Puget and summoned him to Toulon, where he gave him a commission to prepare a model of the most beautiful ship it was in his power to create. That was the origin of the floating palace, the *Monarque*, which was once as famous as the *Livadia* of later time.

Whether Puget produced also works of sculpture is doubtful. His occupations in his own country could not overcome his longing to be again in Rome. Accordingly he went back to that city, and as his ideas were more matured, he was able to derive greater benefit from the works of art which were before his eyes. In 1653 he left Italy and set up in his native city as a painter. The price he charged for large pictures was about four francs per square foot. He fell ill and a wise physician counselled him to follow sculpture, as it would allow of more exercise of his muscles. Accordingly he gave up painting and took to sculpture. He also professed to have competence to practise as an architect.

The first works he produced caused surprise by their extraordinary vigor. They are the pair of terms or caryatides supporting the balcony of the Hôtel de Ville in Toulon. He could not believe that men or slaves in such a position would have the calmness and indifference of the antique examples. He therefore represented them as if they were as conscious of the enormous weight they sustained as any of the porters on the quays. Louis XIV. quickly heard about them, and he at once commanded that they should be transported to Versailles. As they were made up of several pieces of marble, removal was found to be dangerous, and they are still left to ornament Toulon. Near the Hôtel de Ville is a house which it is said Puget designed. Afterward he produced a statue of *Hercules* and a group representing the *Earth Crowning Janus* for a château in Normandy. They were seen by Le Pautre, the artist, and he spoke of them to Fouquet, the superintendent of finances, who at the time seemed to be resolved to surpass Louis XIV. as a patron of art, and who succeeded in exciting the monarch's envy, although it brought the official to ruin.

In those days the patronage of Fouquet was a guarantee of good fortune. Having the command of almost unlimited funds, he was enabled to reward services in a grand manner. He first ordered Puget to proceed to Genoa in order to purchase beautiful marbles. While waiting to have them embarked the sculptor produced the figure now in the Louvre and known as the *Gallic Hercules*. It is far more suggestive of the style of Pietro da Cortona than the caryatides of Toulon. Before Puget had followed the marbles to France the news arrived of the disgrace of his patron. He therefore remained in Genoa, where he obtained commissions for large statues for churches, some of which he finted. He also executed a great bas-relief of the *Assumption* for the Duke of Mantua. The latter was seen by Lebrun, the favorite painter of Louis XIV., who spoke of it to Colbert, and the consequence was that Puget was recalled to France by the king, and was appointed sculptor and director of the works relating to the ornamentation of vessels, or, in other words, became the chief figure-head carver for the royal ships. A pension of 1,200 crowns was awarded to him.

He obtained from Colbert three of Fouquet's blocks of marble. One of them he used for the statue of *Milo of Cretona*, which many consider to be Puget's principal work, and some French critics have claimed that, as an expression of pain, it can be compared with *The Laocoon*. He was not able to discover a model who was sufficiently courageous to allow his foot to be compressed in order to impart reality to the statue. Puget was compelled to enact the athlete, and when his foot was sufficiently distorted by pain a cast was taken of it, which was copied in

marble. Although the work occupied the sculptor for four years, Colbert offered to pay the ridiculous sum of only 6,000 livres for it. Some of the artists who enjoyed Court favor were jealous of the success of the *Milo* and afraid Puget might become a rival. They contrived to have the *Milo* placed in an obscure corner at Versailles, where few could see it. The king, however, insisted on its removal to a more suitable position; it is now in the Louvre. Another block was used for the relief of *Alexander and Diogenes,* which did not please amateurs. It was said of it that it might have been designed by Jordaens, and that the horses could not have been studied from nature. But with all its faults it was a courageous undertaking. Louis XIV. ordered a group of *Perseus and Andromeda,* which His Majesty naturally considered to be Puget's masterpiece, and the courtiers agreed with the royal critic, but the sculptor was not satisfied with it.

Puget could not escape the fate of the majority of artists who sought to win the approval of Louis XIV. The defects of his works were magnified. The sums paid for them did not correspond with their value, and in fact he was treated as if he were a provincial journeyman stonecutter. Worst of all, Lebrun, the painter, presumed to offer designs for works at Versailles to Puget, and assumed the authority and manner of an overseer. The sculptor could not accept royal patronage on those terms, and he fled from Paris to Marseilles. His last work was a bas-relief representing the *Plague of Milan,* which is now in the Musée of Marseilles.

Puget has been compared with Michel Angelo. He resembled the great Florentine in his power of cutting the marble without the aid of full-sized models or mechanical appliances. Puget said, "The marble trembles before me." One of his contemporaries said that while a part of his *Milo* was almost completely finished, other parts were not even roughly hewn from the block. Puget would have approved of M. Rodin's system of leaving a part of the marble in the state it left the quarry. Puget's works are not to be judged by Greek standards, and it must be allowed that his vigor is sometimes not unlike coarseness. But all must admire the manliness of his life and the spirit in which in the seventeenth century he declined to bow to courtiers or to officials. He one time broke one of his own statues when the noble who ordered it began to haggle about the price. Perhaps it is on account of his independent spirit as on his ability that the French continue to admire him and have placed his statue in one of the public places of Marseilles, and his bust as pendant to Nicholas Poussin's at the entrance to the École des Beaux-Arts.—*The Architect.*

HOW TO BUILD HOSPITALS.

THE writer of the following skit that was published in a recent issue of the New York *Evening Post* has evidently been studying the map of New York to some purpose. He is, moreover, quite right in intimating that there is no class of building where waste of funds on mere "architectural treatment" should be so sedulously avoided as in the case of hospital buildings. At the same time, because of the common unwillingness of the poor and uneducated to be consigned to a public hospital for treatment, it is advisable, even needful, that it should present to the eye of the healthy individual such an attractive and comfortable air as will lead him, when he becomes an invalid, to seek its shelter with cheerful willingness and not with feelings of dread and repulsion.

"NOTHING shows more clearly the improved methods of philanthropy than the manner in which hospitals can now be established. Those who furnish the funds should take care that the sum given is not excessive: otherwise they might inadvertently provide for the administration as well as for the building of the institution. The trustees should be chosen with caution. It is a mistake to have physicians or women on the board. It is better to select men well known in the business world who have never been in a hospital, but who are 'a power in finance.' As to the architect, he must, above all else, be a man of taste; for it is imperative that the buildings should be beautiful, and that the fastidious should not be offended. Glass solariums filled with plants to consume the oxygen are much admired. Narrow Gothic windows may not admit much light and air, but there is an 'Old World beauty' about them. A Greek portico with a flight of marble steps sets off the value of the ambulance service. The architect himself should, if possible, be one who has never made a study of hospitals, and so able to bring to his task a mind without prejudice. It is best that he should have been successful as a designer of churches, theatres, university buildings, and club-houses. He will then be able to devise ventilating and heating arrangements to make the wards as breezy as a ship's deck, or as hot as the subway.

"The wards should be as few as possible. There is a great field of usefulness for a hospital which shall provide expensive suites of rooms for the invalid rich. Occasionally the architect makes the hospital proper too conspicuous in his building plans and neglects the weightier matters of reception-rooms and administration offices. These are the parts of the institution seen by casual visitors, and it is well to have them not only comfortable, but ornamental. Money that may be required for Persian rugs, expensive furniture, and rare plants should not be wasted on milk, fruit, and other delicacies. If the latter are needed, let them be supplied by relatives of the patients.

"The site of such a building should never be in a crowded neighborhood, for, if too easy of access, the hospital will be filled with a most undesirable class of people, many of them diseased and crippled. It is better to choose a location remote from the crowd, such as might be selected for an astronomical observatory. This makes for the comfort of accident cases especially, and for all those whom it is dangerous to move. On general principles it may be said that the longer the drive to the hospital, the smaller the death rate within its walls.

"The operating-room should in appearance resemble the interior of a Greek tomb. It is sometimes placed, very foolishly, too near the wards, thus preventing the patient from enjoying the pleasant change of scene while being taken to be anesthetized. Under some kinds of management it is insisted upon that there should be a sunny exposure to the operating amphitheatre, but superintendents may well prefer to be able to exhibit 'our new system of electric lighting.' An important adjunct to the modern hospital is the 'convalescent home' to which may be sent the victims of unsuccessful operations, together with those whose diseases have not been diagnosed. It is sometimes maintained that a department for 'incurables' is a crying need of our hospitals. If so, it is much better to call it a department for convalescent patients."

NEW YORK'S CHARM.

TO the Parisian who sees New York for the first time it must appear a wilderness of sprawling ugliness. He is shocked rather than dazzled by most of the things with which he is expected to be impressed, and his eyes, nose and ears are constantly and cruelly assailed by sights, smells and sounds to which New Yorkers through long familiarity are oblivious. 'A big iron bazaar, and dirty beyond belief!' was the verdict of a Frenchman who fled from it in dismay and disgust at the end of twenty-four hours; and, while not every Frenchman who arrives in New York takes to his heels in this inglorious fashion, the criticism is fairly typical of the way New York strikes the fastidious Gaul.

"To the American returning to New York with a point of view gained by a long residence in Paris, the New World metropolis must spell disillusion. The squalid, sagging, lurching wood-and-iron wharf line—the thing above all others he would most willingly have missed—confronts him on his arrival practically unaltered, except that it seems to him, in comparison with the trim and tidy banks of the Seine and the clean, substantial stone docks of Havre he has just left, more insufferable than his memory pictured it. Everything else has changed, and changed, it seems to him, for the worse.

"Trinity spire and the Produce Exchange tower, which used to refresh his vision downtown, are hidden by a score of nondescript skyscrapers, and the beautiful lines of the Brooklyn Bridge are broken by these same intruders. The exquisite City Hall suffers likewise from their proximity, and will soon be perceived but dimly, like a jewel at the bottom of a well. The Bowery, which was erstwhile gay and piquant with glitter and gaud, has degenerated into sodden commonplaceness. Broadway (from City Hall to Fourteenth Street) has become completely Semitic, without having acquired thereby a scrap of Semitic charm.

The old-fashioned dignity of Washington Square has been

irretrievably compromised by a modern corporation building which adds insult to injury by wearing on its façade the Latin motto 'Perstando et prestando utilitati.' Furthermore, this insolent structure so dwarfs the Washington Arch as to give it the artificial air of the frosted showpiece of a confectioner's window. Union Square, which could never pretend to gentility or beauty, but which had, notwithstanding, an agreeable little presence of its own, has been rendered positively uncanny by the erection of a number of lean, spectral horrors. The symmetry of somnolent, unpretentious Stuyvesant Square and the coziness of Gramercy Park, where The Players live, have each been sadly marred. Madison Square, which was long, and with reason, the most loved spot in the city, is now (with its pagan temple bearing Christian symbols, its brownstone church in a marble pen, and its far-famed Flatiron Building) a fit subject for colossal laughter.

"Fifth Avenue (below the park) has lost its restful, if sombre, brownstone unity by its unconditional surrender to retail trade. The formerly compact "Tenderloin" has been harried into spreading its unsavoriness over an indefinite area. The ancient slovenliness of upper Broadway has been emphasized instead of relieved by the gorgeous caravansaries with which it is dotted.

"The limitations of the narrow park, which used to be rather successfully disguised, are now perpetually in evidence, by reason of the multiplication of soaring apartment houses along its sides.

"Venerable Columbia, which forsook, perforce, its sleepy, artistic Madison Avenue quadrangle when it decided to become aggressive, appears callow and crude in the splendid isolation of its wind-swept hill, and must continue so to appear until it can contrive to conceal its pathetic, almost indecent nakedness by trees, or can persuade the city to move up around it.

"The Hall of Fame, which has refused to open its doors to such world-glories as Whitman and Poe, is as unimpressive as this provincial attitude demands.

"The Bronx, though happily saved from annihilation by the Park Department, is no longer the ideal and idyllic refuge it was of yore. Long stretches of the Palisades have been quarried out of existence. Brooklyn, always a desert, has expanded into a limitless desert.

"In a word, this returned New Yorker finds few familiar landmarks; and the few he does find seem to have lost most of their original meaning. He is as much dazed and puzzled by his surroundings as Rip Van Winkle after his twenty years' sleep. Nobody resides, does business, dines, or drinks in the same places as before. Nobody frequents the same pleasure resorts. Nobody saunters along the same walks. It is not safe for him to make a business or social call, or to set out for a restaurant, a chop-house, a theatre or a club, without consulting the directory in advance; and, even so, he risks having his trouble for his plans, inasmuch as there is more than a chance that a move has been made since the directory was issued.

"After he so far recovers from the shock of his initial disenchantment, however, as to be able to take note of details he finds that there is some balm in Gilead, after all. At the end of a month he begins to catch the spirit of New York, and at the end of six months he has come completely under its spell and loves it, as Montaigne loved the Paris of his day, 'with all its moles and warts.'"—*Alvin F. Sanborn in The Atlantic Monthly.*

A PITIFUL SUICIDE.

WELL do I recollect when an errand-boy in the streets of London at the time of the Crimean War (so long ago as 1855) looking with admiration approaching reverence at the grey granite figure that then and still stands upon a base of the same material at the end of King William Street, E. C., and which represents our fourth king of that name. Now, as then, it holds its own with any other granite statue in the metropolis. Some may, perhaps, recollect its story—a very sad one! Its sculptor, a clever young fellow—a native of Belfast, I believe—miscalculated the cost of working so hard a material, and, ere he had completed his task, found that the blacksmith's bill for "sharpes" alone almost amounted to the sum he was to receive for his commission. Friends and admirers buoyed him up with the hope that Government would favorably consider his position in the end and allow him a further grant. But these anticipations proved delusive. He appealed again and again to the powers that were then in office; but his representations were of no avail, and with financial ruin staring him in the face, in desperation he at last put an end to his existence by suicide. Things have somewhat changed since then, and especially so in New York. There are practically no such things in that city as "smith's bills," for marble and granite are worked without the sharpening of or use of either chisels or points. The whole is done by the wonderful medium of pneumatic tools. These enable a man to get over as much work in an hour that, unaided by them, the human hand could not hope to do in a whole day, or anything like it. Their use is universal by all large concerns in New York, as in many other places in the United States. Huge sheds may be visited, in which hundreds of craftsmen are employed, and scores of tons of marble or granite are formed into desired shapes every day. In these busy hives of human industry the ear is deafened by the burr of the diamond cutting-saw and the buzz of pneumatic tools. But the steady thud of the mallet as it falls rhythmically upon the head of the chisel is a sound but rarely heard. I was much impressed by this while visiting several of the great yards in this city, and particularly so when paying a delightful one to the spacious atelier of Messrs. Piccirilli, situated at 717 East Forty-second Street. This clever family consists of no less than eight brothers, natives of Carrara, in which sunny Italian city I once had the great pleasure of meeting several of them, and have now had the gratification of renewing the acquaintance during my present visit to New York. The latter city is now their established home, and they possess a large connection, devoting a considerable portion of their talents to reproducing in granite and marble the clay models of some of the best New York sculptors. At the present time, among much other work, they have in hand the four colossal groups representing, respectively, Europe, Asia, Africa, and America, that are destined to grace pedestals immediately in front of the New Custom House. These are in Tennessee marble. Assisted by an intelligent staff of a dozen or more of their own fellow-countrymen, these busy sculptors have the groups in question far advanced toward completion. All the work is being executed through the medium of pneumatic tools of various sizes driven by electric motive power, and simply guided by the human hand. The artist holds one of these tools encased in a protective handle and presses it against the marble. As the tool revolves at the rate of many thousand times a minute, the chips fly off in every direction, and the result is that this particularly hard and close-grained marble is cut as readily as if it were so much alabaster or soapstone.—*Harry Hems in The Building News.*

COMMUNICATION

TWENTY-FIVE-FOOT TENEMENT-HOUSES.

October 8, 1906.

To the Editors of The American Architect:

Dear Sirs:—In your article in the issue of September 22, 1906, concerning the controversy between the Brooklyn Society of Architects and the Tenement-house Department, you advocate a law prohibiting the erection of any dwelling-house containing more than one family on a single twenty-five-foot lot. I am obliged to disagree with you on this point, inasmuch as it is not only possible, but in many cases absolutely necessary, to erect buildings on twenty-five-foot lots in the various sections of Greater New York.

There are innumerable cases where a single lot is located between buildings that are of substantial and often modern construction, and of such value that it would be impossible to have them demolished in order to enlarge the adjoining twenty-five-foot plot. The value of ground is such that it would not be possible to erect a one-family dwelling on such lots; therefore, in order to make it pay, it becomes necessary to go skyward and to have as many families in the building as possible, or as the neighborhood will allow.

It is a fact known to architects of experience in planning under the present Tenement-house Act that a satisfactory building can be erected on a single lot, from two stories to six stories in height, with ten to twelve rooms on each floor, and divided into almost any number of apartments.

Such a building can be planned to comply with every requirement of the Tenement-house Act, as to light, ventilation, sanitation, etc., and, as you are no doubt aware, the present Tenement-house Act requires most liberal provisions to be made for light, ventilation, etc.

The class of building, the plans of which the Commissioner recently has refused to approve, do not come under the head of such buildings as I have mentioned.

As is always the case in or around New York, the moment a law is passed that may interfere with the assumed rights of the speculator, there is immediately a hustle and bustle to find a way to evade, if not the letter, at least the spirit of the law; thus the creation of the type known as the "alcove" or "curtain-pole" house.

These houses are ostensibly built with each apartment containing two rooms, but in reality so arranged with grilles, movable wardrobes, dressers, etc., that they may be converted into four rooms, thus creating two dark interior rooms which have no provision for ventilation or light of any kind.

As the law expressly provides that no room may be created which does not contain at least a specific number of square feet floor area, and a window of given glass area, opening, lighting and ventilating on a yard, court or street of a given size, such rooms as the interior rooms of the curtain-pole houses can be nothing less than a violation of the law.

It is absurd to think that two-room apartments in which each room usually is thirty feet or more in length will be used as two rooms after the builder gets his final certificate.

An inspection of such buildings as are now occupied will at once convince anyone that instead of two rooms there are actually four.

I can assure you that all the architects who have been designing such buildings knew full well that they were violating the law, if not in letter at least in spirit.

There was no need to notify either the architects or builders of the Department's intention to discontinue the approval of such plans, as they had been expecting such a move since the day the first one was approved.

It is only a short time ago when one of the architects who I believe has planned the bulk of the "alcove houses," notified his clients, or prospective clients, that it would be to their interest to have their prospective plans prepared and approved at once, as the Department was awakening to the fact that such buildings were contrary to law.

It is greatly to the credit of the present Commissioner, Mr. McKeown, that he has had backbone enough to stop the further erection of this nefarious type of house, for there was no doubt great pressure brought to prevent such action.

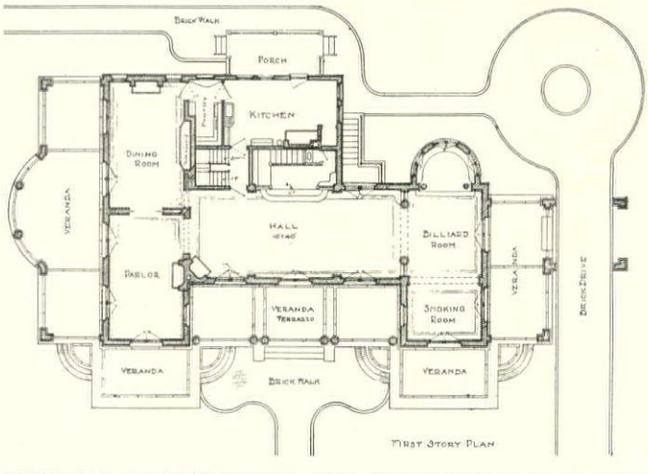
It must be an everlasting shame to the past Commissioners who sat idly by and allowed such structures to be built, especially if they see the unsanitary conditions their lack of courage and decision have created.

A casual survey of the situation will prove that the architect who has something more than his financial interest at heart is not included among those who are complaining about the Commissioner's action.

ROBERT T. RASMUSSEN.

ILLUSTRATIONS

DETAILS OF THE "HOME CLUB," 11-15 EAST 45TH STREET, NEW YORK, N. Y. MESSRS. GORDON, TRACY & SWARTWOUT, ARCHITECTS, NEW YORK, N. Y.: SIX PLATES.



HOUSE OF J. WALLACE MORRELL, ESQ., ALLENHURST, N. J.. MESSRS. TOTTEN & ROGERS, ARCHITECTS, WASHINGTON, D. C.

HOUSE OF ROBERT B. DODSON, ESQ., WEST ISLIP, LONG ISLAND, N. Y. MESSRS. KIRBY, PETIT & GREEN, ARCHITECTS, NEW YORK, N. Y.

Additional Illustrations in the International Edition.

THE HOUSES OF PARLIAMENT, THE HAGUE, HOLLAND.
THE SAME LOOKING TOWARDS THE MAURITSHUIS.
THE MINT TOWER, AMSTERDAM, HOLLAND.
THE HALL OF KNIGHTS, THE HAGUE, HOLLAND.

NOTES AND CLIPPINGS

OVERCROWDING IN BRUSSELS.—An official report shows the congestion of people in the tenements of Brussels: The committee visited 654 tenement-houses, distributed through 17 streets and 50 alleys. The places visited contained 2,095 rooms, 251 garrets, and 16 cellars, in which were lodged 1,087 families, numbering 4,636 persons. Two-thirds of the tenements were found totally deprived of open air and space. Other sanitary accommodations were of the poorest type. Families occupying one room vary from 1 to 10 persons, the average being 4. Notwithstanding the overcrowding, the houses were generally found to be kept clean and tidy. In several instances families were found to have been occupants of the same quarters for periods varying from fifty-one to seventy-six years. The monthly rent varied from $2.12 to $5.79.—*Consular Report.*

RECENT DISCOVERIES AT ARGOS. — The archæologist Wilhelm Volgraff has recently made some interesting discoveries at Argos. He has brought to light the remains of a fortified city which appears to antedate the Mycenæan period. He found a large number of pieces of ceramic ware, among which was a type of "bucchero nero," whose manufacture recalls that of the period of the first city of Troy, with the difference that the Trojan bucchero is fashioned by hand, whereas this recent discovery shows traces of the wheel. He has also discovered fragments of vases, painted with a fine black, and of which the sober decorative design is of a geometric character. At the foot of the excavated hill some tombs of Mycenæan chiefs were opened, in which were found fragments of vases painted with geometric designs, some gold jewelry, ivory tablets, and objects of bronze, stone, and glass.—*New York Evening Post.*

TAMPING AND THE STRENGTH OF CONCRETE.—Some tests undertaken at the instance of the German Concrete Association give a fairly clear indication of the influence of tamping on the strength of concrete. The tests were conducted at three different places with the same class of material and in accordance with the same conditions. Concrete cubes of 12 inches were formed under 6, 12 and 18 blows from a 26-pound tamping hammer falling freely from a height of 10 inches. The cubes were moulded in two layers, and after the first layer had been tamped in the mould its upper surface was roughened to secure a satisfactory tooth for the second layer, which was then tamped in. After remaining for forty hours in the mould the blocks were stored in wet sand for twenty-eight days and tested under compression in the direction of tamping. Two different percentages of water were adopted, and some of the concrete was mixed by hand and some by machine. The tabulated collection of results shows that the compressive strength of dry concrete mixtures was increased by from 12.4 per cent. to 22.2 per cent., and that in the case of plastic mixtures the increase varied between 3.2 per cent. and 18.6 per cent. The figures also indicate that beyond a certain number of blows the tamping causes a gradually decreasing augmentation of strength, and finally leads to diminution of the augmented strength. The results further show the superiority of machine-mixed over hand-mixed concrete.—*The Builder.*

THE SUSPENSION BRIDGE AT BUDA-PESTH.—Amid the splendors of Buda-Pesth the members of the Eighty Club are not likely to see anything more important than the great suspension bridge, the construction of which in 1849 gave new life to the towns of Buda and Pesth. But the bridge over the Danube is more than a channel for the life-blood of the two old cities; it is a symbol of the energy and enterprise of England. For it was constructed by Mr. Tiernney Clark, the engineer who gave us Hammersmith Bridge. Surely no suspension bridge was ever tested more severely before being opened to the public than the one at Buda-Pesth. The very first use made of Mr. Clark's work was in the interests of war. The whole army of the Hungarians, hotly pursued by the Imperial forces, passed over the bridge. For two days the "platform was one dense mass of moving soldiers."—*London Tattler.*

The American Architect and Building News.

Vol. XC. SATURDAY, NOVEMBER 3, 1906. No. 1610

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AS was to be expected, the Pennsylvania newspapers teem with gossip about the new Capitol and those who built it, but most of the matter, whether accusation or denial, seems too vague in the matter of particularization to lead one to feel it trustworthy. Two facts, however, are worth noting. The new State Treasurer, Mr. Berry, who unearthed the scandal and who is strenuous for a real and searching investigation, is said to be staggered by the magnitude and intricacy of the contracts and accounts that must be examined, and that in consequence he has expressed the hope that architects and building experts would volunteer their aid in sufficient number to make the task if not easy at least practicable. It seems to us that here is the very opportunity which should be seized by those members of the Philadelphia Chapter who were most eager in opposition at the outstart, for it gives them a chance to establish their own *bona fides* in the matter, and also an opportunity to apologize handsomely to the architect of the building in the event—near or remote—that investigation proves that in every way his action has conformed absolutely with the best customs and practices of the profession. The other matter is revealed in the formal statement of Governor Pennypacker denying that in any particular there had been any wrongdoing or graft connected with the erection of the building. The Governor, who takes the ground that all expenditures were right and proper and that the State was well able to afford the outlay, since the money was in the treasury and uncalled for, explains the presence there of those idle nine millions in this way: "One member of the Board, the Auditor General, by increase of energy in the pursuit of delinquent corporations and otherwise, has in his own brief term added enough to the revenues to pay for the entire equipment." This is interesting, of course, but it does not necessarily follow that it was right to expend, on very dubious authority, so large a sum fortuitously at hand. One wonders whether the building would have been left unfurnished if the delinquent taxpayers had not so opportunely squared their accounts.

IN our Northern cities, we are familiar enough with the sight of a modern version of Penelope's never-ending task—the battle between the snow-plows of the surface lines and the snow-shovels of the abuttors casting the snow back upon the track as soon as the plow has passed. An even more extraordinary rendering of the legend, it is said, can now be seen in San Francisco, where the rubbish and débris removed by the lot owners from their cellars and placed in the streets is now being shoveled back into the cellar excavations by the public forces, in compliance with the order of the Board of Public Works that streets and sidewalks must be cleaned up so that traffic can proceed. Even if the lot owner ought to have carted away the remnants of his old building and not piled them in the public street, he has already suffered enough, and a spirit of fair play and common decency should restrain the public, of which he is an atom, with all an atom's rights, from casting back upon the partly finished foundations of his new building the completely finished relics of his old one. Two wrongs do not make one right. What the common citizen of the unfortunate city is enduring in these days at the hands of inconsiderate public officials, more unscrupulous political bosses and heartless trade unions, few outsiders can have any real conception. Behind and below all the blatant talk of the splendid way in which things are being "done" to restore the city to an immediate pre-eminence, there must be a vast amount of discomfort and suffering which even the "ten-cent magazines" will never exploit. If the coming winter passes without a revival of the vigilance committee, it will speak well for the community's fundamental respect for law and order; but, in view of the fact that Baltimore after its conflagration at once increased its police-force, the reduction of San Francisco's police-force by a third under similar circumstances has a purposeful and baleful aspect that does not promise well for the peace of the community.

THE annual report of the Art Institute of Chicago is a very interesting document, as could hardly fail to be the case with any report that dealt fairly with the undertakings of the many-sided institution that does so much to lend tone and character to the Western metropolis. Financially considered, the year has been most satisfactory, since the treasurer reports that receipts "from all sources" exceed outlay by nearly thirty thousand dollars, and this in the face of the fact that the Art School made a deficit of over twenty-six hundred dollars. The latter fact seems hardly explicable, in face of the fact that Mr. W. M. R. French, the Director—and to his patient adaptability the Institute owes more than to any other single man—reports an increase in attendance and receipts, and states that during the twenty-seven years of its existence the total expenditures made on behalf of the School have been less, by more than a thousand dollars, than the collections made in its behalf, and these collections make the very respectable sum of

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$656,617. Mr. French draws attention to a very significant fact that shows how its character as a real school of art is solidifying. In 1892, in the day classes of drawing and painting there were seven times as many women as men, while at present there are less than twice as many. As women attend these classes largely as a temporary distraction, while men enter them to prepare for their life work, the inference that the School is gaining favor as a place where Art may be studied seriously and profitably is both plain and justifiable.

THE quarterly "fire report" of the Electrical Bureau of the National Board of Fire Underwriters is to the layman a very unimpressive document, in view of the general belief that a very large number of fires in this country are due to electrical causes. This brief document of some half-dozen pages emanates from Chicago, but it nowhere appears whether the statistics are gathered from that city only or from the entire country; but the fact that the report is issued by a "National" body and contains illustrations of a certain burn-out that occurred at New Orleans invites the inference that the statistics are sedulously gathered from forty-odd States and Territories. In view of this, the statement that the total fire-loss for the quarter due to electrical causes was only $160,588 is surely as electrifying as anything well could be, particularly when a single fire caused a loss of $138,000, and this fire, too, was due not to any vice of improper electrical installation, but to a lightning-stroke, pure and simple. On the testimony of this report electricity would seem to have become a substance fully as innocuous as it is mysterious and electricians to have become past-masters in the art of safe wiring. The only item of unusual interest amongst the cases where particulars are given is one that describes how apparatus of various kinds in the immediate neighborhood of the sending station of a wireless-telegraph plant were short-circuited and burned out by the electric energy dissipated from the wireless apparatus. It is none too easy, now, for people obliged to have aerial wires enter their premises to protect themselves from disaster due to the falling of high-tension wires upon telephone or telegraph circuits, and if the Hertzian wave is going to prove an incendiary element, there will be many a timid householder who will discontinue his "telephone number."

THE advisability of reading one's fire insurance policy thoroughly and understandingly is made plain by the tale told, in the course of an article on insurance, in *"L'Architecture et la Construction dans le Nord."* A certain currier insured his shops, built with brick walls, and wooden floors, and the policy, amongst other conditions, stipulated that underneath the stove used for the making of glue there must be set a slab of cast-iron. Some years later the shops were rebuilt, and, this time, the floors, too, were of brick, covered with tiles laid in cement—a good fireproof floor, in short. The new buildings, of course, were not covered by the old policy, and a new one had to be drawn. The ingenious clerk, after filling out his blank with the description appropriate to the new building, turned to the old policy and copied therefrom all the conditions it contained, and the currier, without reading the instrument, accepted it, paid his premium and went about his work with a light heart. Some time later, in spite of the shops' being endowed with fireproof floors, a fire occurred in them, so serious that the loss was some $16,000 dollars. The unfortunate tradesman naturally applied to the underwriters for the proper indemnification, and they, as naturally, sent an adjuster to examine and report on the case. The adjuster went carefully over the ruins, policy in hand, and, as the floors were really fireproof and indestructible, he easily found the glue-melting stove standing undisturbed in its place, but he did not find beneath it the slab of cast-iron which the second policy, like the original one, stipulated should be put there, though, of course, quite uselessly. Having discovered this gross breach of the accepted conditions, the insurers refused to make any payment whatever, were then sued, and their conduct was upheld by the court!

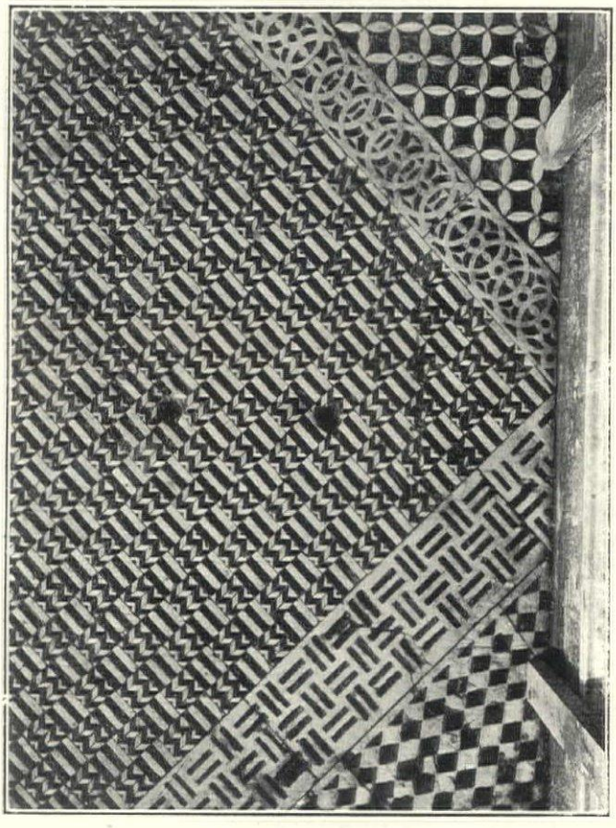
AS we have already given some account of the misunderstanding that arose some time ago between the citizens of Buffalo and Mr. George J. Metzger, who for nearly a dozen years has acted as official architect for Erie County, it becomes proper to record how the misunderstanding has been adjusted. Public opinion has at length prevailed, and last week the Board of Supervisors voted, by a very close vote, to discharge the architect. He is, however, to be allowed to carry out certain work already in hand, but this does not apply to the armory for the Sixty-fifth Regiment, the extravagant appointments of which are largely responsible for his dismissal. It is said that Mr. Metzger proposes to sue the officials who dismissed him for defamation of character. He could hardly have any other good ground for a suit, as the Supervisors unquestionably had the right to dismiss him, if they found reason for it.

IT seems to us rather regrettable that at so early a date as this the daily papers should authoritatively announce the name of the eminent English architect to whom is to be presented a gold medal at the semi-centennial meeting of the American Institute of Architects, to be held in January at Washington. As the Royal Gold Medal of the R. I. B. A. had twice been conferred on American architects, international courtesy seemed to make it obligatory that the first award by the American Institute of Architects of an unusual honor should be made to an Englishman, and the selected architect is at least as deserving of it as any of the three or four other architects whose claims were doubtless canvassed at the same time with his. As to the other recipients of intended honors, we hope that their names may be kept from the profession and the public up to the last moment, after the fashion usually followed by our universities when conferring honorary degrees. The uncertainty as to whom one is to see on the platform on the fated day adds a flavor of Attic salt to the ceremony which can ill be spared by the onlookers, who have no immediate personal concern in the ceremonial.

THE ARTISTIC PAVEMENTS OF ITALY.—II.

THE Cathedral at Murano preserves the remains of a pavement dating from 1140, that recalls that of St. Mark's, and this will help somewhat to fix the true date of the latter. Venetia should not be neglected by anyone who would pentrate the mysteries of my topic. Verona and Vicenza, for example, offer important material for one who is studying the artistic pavements of Italy, but in a general essay such as this one cannot signalize everything that has a bearing on the subject. It is needful to note the custom, a very old one in Italy, of sharing the cost of a pavement amongst several contributors, so we often find wrought in the pavements of Italian churches the names of those who have subscribed funds for it, an amiable custom that was much in vogue in the eleventh and twelfth centuries, a time when Italy was enriched with a number of artistic pavements, almost exclusively ecclesiastic in character. From this abundance a selection must be made with some discretion.

I will mention first one of the oldest and least known, one in the crypt of S. Savino at Piacenza, which dates from the eleventh century. Here medallions are shown upon a background of zigzag work, and the medallion scheme is also used in the choir of the cathedral at Aosta. This church is also embellished with another fragment in addition to that in the

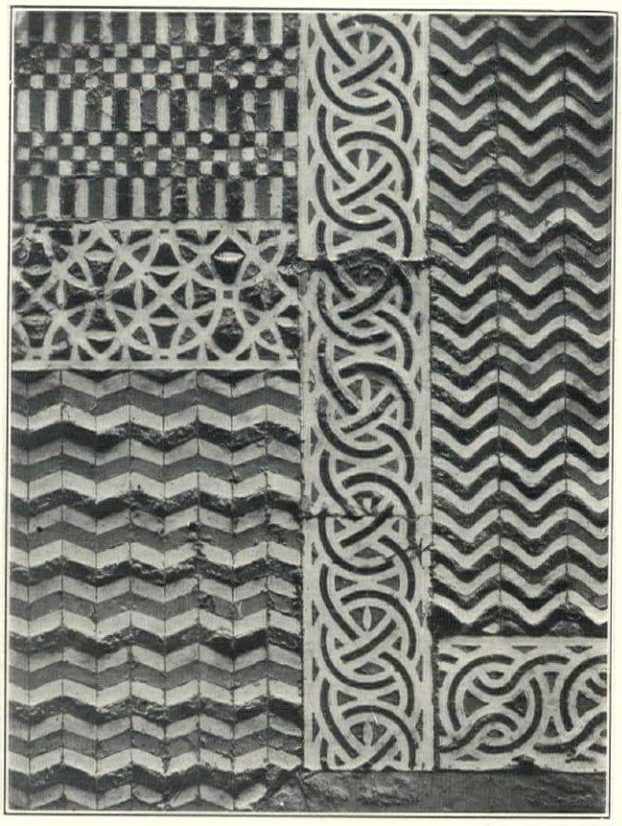


DETAIL OF PAVEMENT IN THE BAPTISTERY, FLORENCE.

choir, and this leads one to suspect a rather magnificent composition—symbolic images, fountains, rivers of Paradise, scroll-work, circles, medallions representing the months of the year, an illustrated calendar, in short.

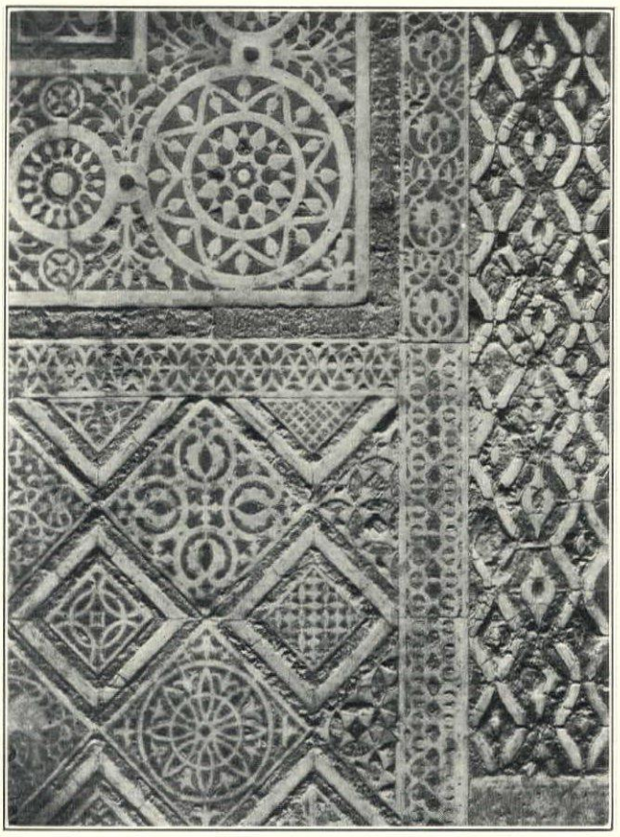
The calendar *motif* is far from being a rarity in the Italian pavements of the Middle Ages, and its repetition in several places leads one to think that it indicates a custom that may well be remembered by anyone who sets himself nowadays to design a pavement for a Gothic church.

Piedmont, less known, artistically speaking, than it deserves to be, has other pavements than the one at Aosta, and these must figure here by the names of the churches where they can be found. Those who would enlarge the boundaries of their knowledge will find here the hints of which they stand in need. Pavements may be found in the cathedrals at Casale, Novara, Ivrea, and in Sta. Maria Maggiore at Vercelli, where one discovers a musical scene depicted: David surrounded by a choir. This *motif*, like that of the calendar, is quite commonly found in mediæval work: we find it quite as often in miniatures as in pavements. The date of the pavement at Vercelli (XI century) brings to mind the pavement which stretches out in the Badia Pomposa, near Ferrara, one of those Italian churches that are lost sight of because of their isolation, yet one which is a very



DETAIL OF PAVEMENT IN THE BAPTISTERY, FLORENCE.

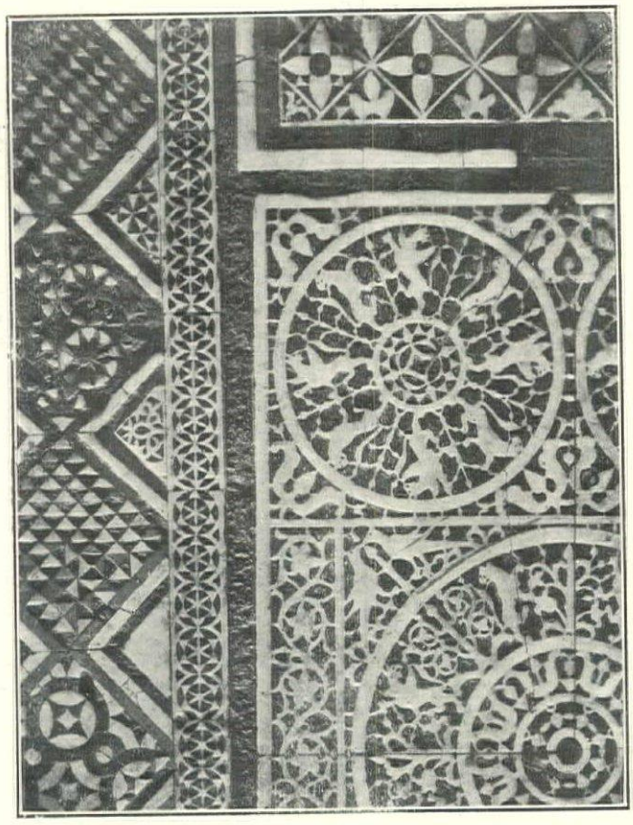
treasure-house of beauty. The remains of the pavement in the Badia Pomposa date to the eleventh century, and they possess



DETAIL OF PAVEMENT IN THE BAPTISTERY, FLORENCE.

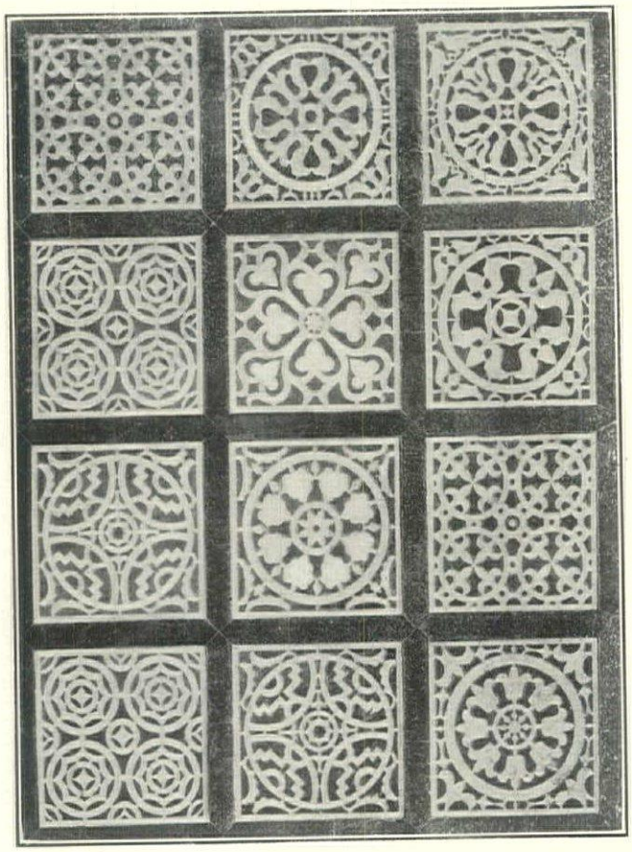
the merit of actually bearing the date (1026), just as does that in the cathedral at Murano.

Without leaving Emilia, I can enumerate the fragments, little known, of a pavement in the cathedral at Reggio and the mosaics



DETAIL OF PAVEMENT IN THE BAPTISTERY, FLORENCE.

in S. Tommaso and S. Prospero which belong to the epoch we have now reached, and to which belongs the bit of pavement at



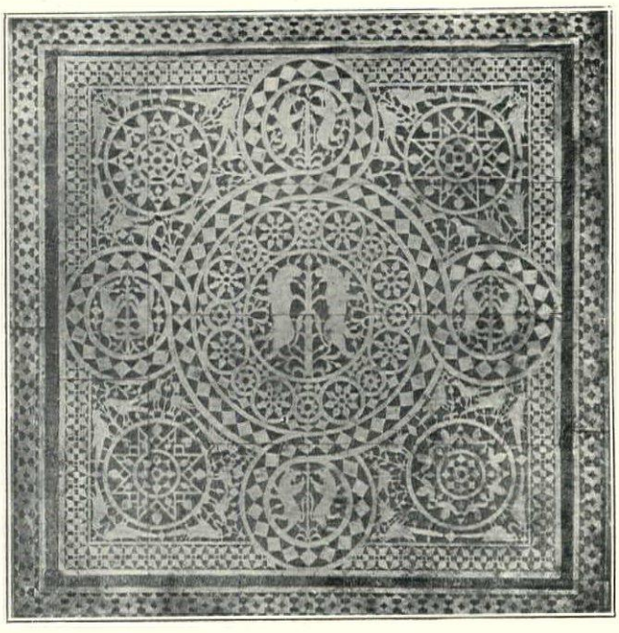
DETAIL OF PAVEMENT IN S. MINIATO AL MONTE, NEAR FLORENCE.

S. Benedetto Polirone in the village of S. Benedetto Po in the Mantuan territory, also pavements at Brescia, Cremona, and Pavia, a knowledge of which is quite indispensable to one who has a taste for Italian pavements of the Middle Ages.

My readers should also study a perfect cycle of pavements in Central and Southern Italy, far more important than those geometrical ones that are better known. I will mention the pavement of the eleventh or twelfth century, in S. Pietro at Toscanella, a church that is superlatively remarkable for its age (VII, XI, or XII century) and for the picturesqueness of its composition as well as for the poignant beauty of some of its details—capitals and friezes.

I will mention, too, the pavement in the famous basilica of S. Niccolà at Bari (late XII or early XIII century), and also one in the cathedral at Otranto, one of the most interesting pavements in all Italy. A work of the eleventh or twelfth century, in the first place, it offers a grand and striking confusion of unnumbered things, animals, images, and trees, and when the eye stops to study the design carefully it soon discovers the "tree of life" resting upon two elephants toward which animals of every kind are wending their way.

I will also mention, in Southern Italy, the pavement in the cathedral at Brindisi, precious in that it is accompanied by an inscription that fixes its age (XII century), and also that in the Abbey of Sta. Maria del Patire, near Rossano (Cosenza), with lions and other animals—it must be remembered that I am still



DETAIL OF PAVEMENT IN S. MINIATO AL MONTE, NEAR FLORENCE.

speaking of mere fragments—and that of the cathedral at Sessa Aurunca with its circles and intersecting squares; also the one in the Abbey of Tremiti, quite an unusual type, but common in Apulia and Calabria; also one with geometrical design carried out in fine marbles in the Church of St. Benedetto (XI century) at Montecassino which happens to be illustrated by an engraving of Gattola's in Bertaux's work on the monuments of Southern Italy.

I regret not being able to tarry over these examples which lend such an expression of originality to our patrimony in the decorative arts, but two superb pavements which quite eclipse in interest those I have just mentioned now occur to me. I refer to the pavement that so sumptuously decorates the Baptistery at Florence and that which stretches out through the basilica of S. Miniato al Monte, also at Florence. The first consists of large squares wherein, just as in the case of the second example, two by two and enclosed in circles, strange animals menace one another. There is, too, near the principal door, a large panel decorated with the signs of the Zodiac, the conception, rumor has it, of Strozzi in the eleventh century. This is often mentioned, and Dante in the *"Inferno"* says:

"Io vidi per le coste e per to fondo."

The other pavement, the one in S. Miniato, bears a date (1207) which sufficiently indicates the age of its relative in the Baptistery. This pavement at S. Miniato also embodies a zodiacal panel, which is here illustrated. Now, after having indicated the variety of treatment in these two Tuscan examples, I must turn toward Rome, only stopping long enough in Latium to point out that at

Pisa, in S. Pietro in Vincoli, a little Roman church, there is a pavement which should be mentioned in this brief but conscientious study of our subject.

Rome and Latium are as rich in pavements as the most prolific region in the whole peninsula. The reader must remember the family of the Cosmati, to whom we must, or at any rate do, attribute numberless works in mosaic that belong to the twelfth, thirteenth and fourteenth centuries. Passing by many wrongful ascriptions to the Cosmati, as well as the work self-styled "Cosmatesca," and confining myself strictly to pavements, I will say that Roman artists, or, rather, Roman marble-workers, overshadowed by the genius of the Cosmati, created a number of pavements in the geometric style common to the greater part of mediæval Italian pavements. These masters made use of circles, stars, interlacing friezes made up of small squares and triangles, black on white, in tedious sameness. The reader who would convince himself of this may turn to the Roman churches of S. Crisogono, Sta. Maria Maggiore, S. Lorenzo, S. Clemente, and in Latium may examine the cathedral at Anagni and Sta. Maria de Costello at Corneto. If it is impossible to do this in person, he may turn to De Rossi's sumptuous work on the pavements and mosaics of Rome with its superb illustrations in color, or consult Stern's work on Roman pavements with its illustrations drawn to large scale. It has been remarked with justice that the pavement of

ZODIACAL PANEL: PAVEMENT OF S. MINIATO AL MONTE, NEAR FLORENCE.

S. Crisogono is a complete model of the work of these marble-workers. There were several families in Rome and Latium who executed work that has been wrongfully attributed to the Cosmati.

There are many pavements I have not enumerated belonging to the same school of work as that at S. Crisogono; for instance, those in Sta. Maria in Cosmedin and S. Ivo at Rome, and search should be made elsewhere before setting out for Sicily, where the Byzanto-Roman ornament named after the Cosmati found great favor.

The reader who knows his Sicily will think at once of the Capella Palatina at Palermo and the cathedral at Monreale. The pavement in the Capella Palatina—a very jewel of Byzantine architecture—so excited a reverend gentleman during the time of Roger II. (1154) that in the presence of the King he broke out into the warmest of eulogies on the church, not forgetting its sumptuousness, its mosaics, its ornaments and its pavement "executed by a master and built of bits of various colored marbles."

ALFREDO MELANI.

(To be continued.)

CHIMNEYS AND FLUES.

AT the last annual meeting of the National Fire Protection Association the following report was adopted:

Your Committee on Chimneys and Flues has interpreted its subject as meaning all conveyors of heat or the results of combustion, and at the outset we beg to say that we consider this subject as practically an inexhaustible one on account of not only the various classes of flues, but also on account of the unlimited types, constructions, arrangements, purposes and locations of each of the various classes.

Chimneys and flues have been investigated from the standpoint of construction, location and protection by the architect, builder, and manufacturer as well as by the insurance interests, until at this time we have these subjects treated of in all building codes, fire ordinances and rulings of the various inspection bureaus in a more or less exhaustive manner, but the variations of temperature in like flues cannot be taken up in these rulings without the writing of volumes upon the question of protection, and so would the consideration of each case of air drafts, ventilation and general surroundings produce volumes of rules and requirements; hence it is that in the various codes and rules each subject has received a general treatment rather than a specific treatment for each condition likely to arise, and it is in this general way, with some attention to specific questions, that your committee has approached and treated these subjects.

As a general proposition, all heat-conveying flues should be free from all contact with inflammable materials, should have a free ventilating space surrounding them, should be securely built and supported, should be so placed that they can be readily reached so as to clean them off on the tops; the distance from inflammable materials is to a great extent dependent upon the construction of the flue, the temperature of the heat passing through it, and the continuous length of time the heat is passing through.

Specifically, we desire to bring to your notice the following features:

In all chimneys and flues of brick construction, only good, hard, well-burnt brick should be used; soft or "salmon" brick should be prohibited; all joints should be struck smooth on inside excepting where the flue is lined with well-burnt clay or terra-cotta pipe; no pargeting mortar shall be used on the inside; for bake ovens, low pressured boilers and similar purposes the brick work shall be at least 8 inches in thickness and lined continuously on inside with well-burnt clay or terra-cotta pipe and be capped with terra-cotta, stone or cast iron; for high pressure boilers the brick work shall be not less than 12 inches in thickness with the inside 4 inches of this wall built up of fire brick laid in fire mortar for a distance of 25 feet in any direction from the source of heat; for smelting furnaces or of steam boilers or other apparatus which heat the flues to a high temperature, shall be built with double walls of suitable thickness for the temperature, with an air space between the walls, the inside 4 inches to be of fire brick laid in fire mortar for a distance of not less than 25 feet in any direction from the source of heat. All other chimney flues shall be lined continuously on the inside with well-burnt clay or terra-cotta pipe made smooth on inside from the bottom of the flue or throat of the fireplace if flue starts from the latter; chimneys not in continual use, or in dwellings from fire-places or stoves, need not be lined, but must be struck smooth on inside. It is not advisable to have any bends or curves requiring a smaller upward inclination than 75 degrees, and all curves and bends are to be deprecated. No flue should be less than 8 by 8 inches. No chimney shall be built up from any floor, shelf or beam of a building where these are of wood. In a frame building where the chimney is not built up from the ground, it should rest on a base of masonry of fire brick set in fire mortar not less than 12 inches thick, this base resting on supports independent of the construction of the building. In a brick building where the chimney is not built in the wall, it should be built as in similar cases in a frame building, or the wall should be corbelled out so as to support the chimney which should then be properly anchored into the wall. In a stone or concrete building the treatment should be the same as in a brick building. All unused flue holes in chimneys shall be bricked up, or closed with permanent, tightly-fitting metal covers, but no papers, bags, cloths, or other inflammable materials must be used for this purpose. Horizontal brick flues should be covered on their tops with neat cement.

In the consideration of the best methods for protecting woodwork and other inflammable materials from the effects of heat from metal heat-conveying flues, we are brought face to face with a question of diversified and various aspects; as, for instance, the thickness of the metal, the degree of heat conveyed, the distance from the woodwork, the continuous length of time that heat is being conveyed, air drafts, and the amount of ventilation about the flue. The class of protection must be considered and required in conjunction with and is dependent on these conditions. In some places metal shields with air spaces of varying depths on

each side will be sufficient,—in other places a heavy coating of asbestos on the flue and an air space between it and the woodwork will answer,—in other places the woodwork should be protected with asbestos overlaid with tin following all lines and angles of the woodwork, standard tin clad,—but your committee is unable, under the varying conditions, to lay down any one method and can only recommend that the protection shall be adequate for the conditions involved and shall consist of practically one of the three above-mentioned methods.

Sheet metal stove pipes should be prohibited where passing through roofs, sides of buildings, where in concealed spaces or where subject to sufficient moisture to cause rusting. Where passing through partitions, floors, or other inflammable materials they should be surrounded with thimbles of metal so constructed as to maintain an air space of at least 2 inches between the pipe and the thimble and with ventilating holes so placed as to carry off the heat from within the timble,—or be surrounded with metal pipe and so placed as to maintain a clear space of at least 1½ inches between the smoke pipe and the surrounding pipe,—or be held in a soap-stone collar or well-burnt clay ring of not less than 2 inches in thickness, and so placed that no wood will be within 2 inches of the pipe; should enter the chimney in full sight, fit the chimney hole closely; should not enter a chimney hole within 12 inches of any wooden floor, partition, or of any ceiling, other than fire-proof construction, unless there is a metal shield with ventilating space on both sides between the pipe and the woodwork, when the distance may be not less than 8 inches, or if the woodwork is covered with asbestos overlaid with tin standard clad, then the distance may be not less than 2 inches. All joints must be tight.

Tile flues, whether of well-burnt clay or of vitrified tile, should not be used; these are subject to breakage, not only from physical shock, but from the effects of heat, moisture, and cold, through contraction and expansion, especially where the variations of these conditions are extreme. If permitted they should not rest upon any wooden shelf, flooring, etc., and should have a space of at least 2 inches between them and all woodwork through which they may pass; they must not be used in concealed space.

Clay pipe flues or chimneys are prohibited.

Any hollow, continuous space in a building constructed of hollow building brick, tile, or cement blocks cannot be made use of as a flue or chimney. This practice is extremely dangerous and is prohibited.

Steam pipes should under no condition be allowed in contact with wood or any other inflammable material; where on the side of a room they should be hung on iron hangers of approved design; where overhead they must be hung on iron holders; where on floors they should be supported on bricks, approved iron supports, iron pipes, or should be hung from above; where passing through floors the floors must be cut away so as to allow a clear space between the pipes and the wood, and the pipes must be properly bushed; should not be in any location where they cannot be easily reached for the purpose of cleaning all dust, rubbish, etc., from them, such as behind benches, false flooring, etc., etc.; wherever placed, or however hung, they must be permanently fixed so as not to be affected in their position by "hammer," expansion and contraction. The overhead method of steam piping is preferred.

Foundry cupolas should have castiron or steel charging floors; should extend at least 10 feet above highest point of any roof within a radius of 50 feet; be covered on top with a heavy wire netting; be capped with a spark arrester, and in all parts be at least 2 feet from all surrounding woodwork.

The size of all dampers in all flues should be limited in area; those in furnace and boiler flues should advisably be of a size of but nine-tenths of the area of the flue opening.

Iron smoke stacks from boilers should not be within 10 inches of any woodwork.

As a summing up of these generalizations we can only point out the fact that the entire matter of safety and protection to the greatest extent lies with the inspector, for, for one building that is being built and in which the architect or builder may be willing to concede the need for care in the construction of these devices, there are hundreds of thousands already built with defective chimneys and flues which need the attention of the proper authorities for their correction, hence it is primarily "up to" the inspection bureaus to apply such rules as we already have.

In addition to the points already brought out we would suggest that—

1. The inspection bureaus give closer supervision of all new buildings, particularly dwellings and others which are subject to cheap construction, and insist to whatever extent they deem justifiable on the application of the building codes of their locations, where there are any, to the bad conditions which may be found being carried out.

2. That all chimneys be cleaned out yearly, at least.

3. That regular rules be insisted upon as to the cleaning of all dust, rubbish, waste, etc., from all steam pipes, and particularly from the tops of all horizontal heat-conveying pipes.

4. That all heat-conveying pipes receive regular inspection in order to see whether they have become loose at the joints, whether they have sprung so as to come in contact with wood, whether they are properly supported.

EFFECT OF MOISTURE ON THE STRENGTH AND STIFFNESS OF WOOD.

VERY little is definitely known about the influence of moisture on the strength of wood, even by those experienced in handling the material. Since the whole subject is one of great importance, the Forest Service of the United States Department of Agriculture has been making a thorough study of it during the past three years and is about to publish the results of its investigation in an exhaustive technical bulletin entitled "Effect of Moisture upon the Strength and Stiffness of Wood."

The chief points presented by the study are:

1. The relation of moisture to strength follows a definite law which can be graphically expressed. Proper drying very greatly increases the strength of all kinds of wood, the amount of increase in strength depending upon the species and the dryness. The increased strength given to green wood by thoroughly drying it is so great that it will surprise many. For example, the strength of a piece of unseasoned red spruce may be increased over 400 per cent. by a thorough drying at the temperature of boiling water. Strength decreases again, however, as the wood reabsorbs moisture. Air-dried wood, protected from the weather, and containing 12 per cent. of moisture, is from 1.7 to 2.4 times stronger than when green, varying with the species. Stiffness is also increased by drying. These conclusions, however, are drawn from small-sized pieces not exceeding 4 by 4 inches in cross-section such as are used in vehicle work, tools, etc. Large timbers require years of drying before the moisture is reduced to the point where strength begins to increase. It must also be taken into consideration that more or less checking always occurs when large timbers dry; and if this checking is excessive it may cause weakness to counterbalance, partially or entirely, the strength gained in drying. Consequently it is not safe to assume that the average strength of large, so-called seasoned timbers is much greater than that of green or wet ones.

2. The fiber saturation point of a number of species has been determined. This point, which varies with conditions and species of wood designates the percentage of water which will saturate the fibers of the wood. It has been found that, under normal conditions, wood fiber will absorb a definite amount of moisture; beyond this the water simply fills the pores of the wood like honey in honey-comb. Only that water which permeates the wood fiber has an influence upon the strength. For the following species, the saturation point occurs at the given percentage of moisture based on the dry weight of the wood:

	Per Cent. Moisture
Long Leaf Pine	25
Red Spruce	31
Chestnut	25
Loblolly Pine Sapwood	24
Red Gum	25
Red Fir	23
White Ash	20.5
Norway Pine	30
Western Tamarack	30

3. Prolonged soaking in cold water does not reduce the strength of green wood below that of its fiber saturation point, provided it remains in perfect condition. When wood has been dried and is resoaked it becomes slightly weaker than when green.

4. Wood soaked in heated water absorbs more moisture because the amount of water which the fiber will contain is increased. This causes a reduction in strength and stiffness, as in wood that is heated or steamed for bending.

ARCHITECT AND ENGINEER.

FALLACIOUS sayings, dictated either by a desire to make an epigram, or resulting from momentary excitement, sometimes gain considerable public credence. Such remarks do not deserve to be placed on record, but when made by a person of

eminence they, unfortunately, too often achieve undeserved notoriety. They may be provocative of thought, but, more often than not, are applauded by the unthinking section of the public. Such remarks can hardly be ignored when constantly repeated. A remark which is reported of Prince Albert has been reiterated by an eminent engineer, evidently with his approval, in a popular book just published. The remark is that Prince Albert used to say that if he wished to *talk* about a thing he would send for an architect, but if he wanted to *do* a thing he would send for an engineer. Obviously, it could be retorted that it would be better if a great many engineers as well as architects talked less and did more. We can easily ignore Prince Albert, but the approval which his remark has received from a well-known engineer, and the fact that this opinion is certainly typical of many members of his profession, as well as the public, renders it desirable to inquire into the chief reasons for such a common opinion. First, perhaps, it reminds us of the disrepute into which the architectural profession brought itself some years ago. This aspect of the subject, however, has often been dealt with, and it is not necessary for us to belabor the dead horse. But another aspect, not only applicable to the architectural profession, but more or less to all the professions, will repay study. Representatives of the working classes have lauded the man who actually does things as being the only useful member of society. In this democratic age they are forgetful that even elementary tribes needed headmen and chieftains to control affairs, to direct labor, and meet their wants in the way of education. The labor advocate might as well look upon the machine as better than its attendant and constructor. The foreman and the labor "boss," crude examples of organizers of labor, are recognized as necessary even by the worker who, because he comes closer in contact with them and understands the part they perform, cannot deny the fundamental logic of their position. The engineer, too, is admitted by the profoundly ignorant because, being a man of science, he is looked upon as a master of the abstruse. The architect, together with all those who work in form and facts that are common every-day things of life, is subject to interference, because the public, having that little knowledge which is dangerous, think they could, if it were their choice or opportunity, deal equally well with these realities, forgetful that considerable difficulties underlie the placid surface of common things which the constructive artist has to master. For instance, in planning, everyone thinks himself best competent to judge as to what would be desirable in the way of convenience and accommodation for living or business purposes. Then, again, in regard to decoration and form, the public believe themselves possessed of taste because they have crude likes and dislikes, the result of associations obtained in a narrow life or as a result of reading, travel abroad, and other visionary and fleeting impressions which are difficult to trace. It is strange, though, that the public should ignore, as a matter of little or no importance, a technical knowledge of construction, or else admit without demur the right of the engineer to this province, merely because he loudly proclaims it and condemns the architect unheard. It is obvious that this assumption of the engineer is entirely unwarrantable, because his profession came into being late in history, whereas the architect was already in possession of the field. By reason of the multitude of details necessary in building operations, it is impossible for an architect to be a specialist in every branch. We are now accustomed to call professional specialists engineers, and the specialist seems inclined to sneer at the architect because he does not know so much about the narraw field of work as the specialist himself does; but this is surely expecting too much. As we have often said, it is the architect's controlling hand that brings the workers into their proper relation. We do not ask the admiral to be able to run the engine of a battleship as well as the engineer. We do, however, expect him to be able to understand, and to convey his directions intelligibly to his subordinates—in fact, to *talk* about a thing; and the architect occupies an exactly similar position. Every member of society is necessary in his own particular sphere, and the attempt of any one section to laud themselves, and to belittle others, is wrong. The worker and the machine are just as necessary as the professional man, and it is not for us to judge their importance in the ultimate fitness of things, but the part each has to play is clear, and we must all recognize the part of the professional man to be to direct the worker. We all know the position of the architect. There are things he can do which the engineer cannot. Consequently, he should be allowed to exercise his profession without interference from those outside.—*Builders' Journal.*

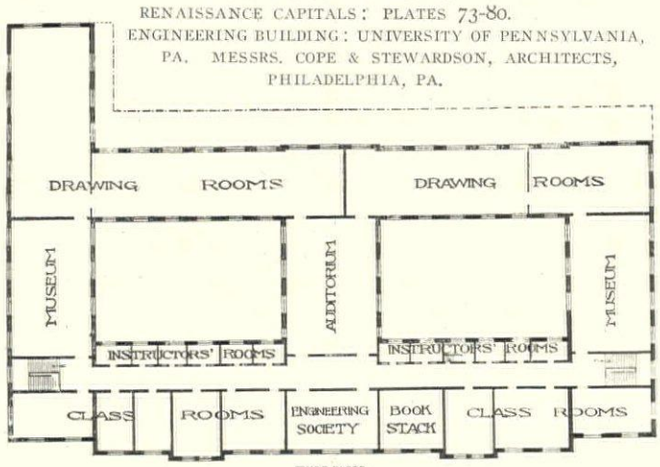
ILLUSTRATIONS

HOUSE OF ROBERT S. NEWHALL, ESQ., GERMANTOWN, PA. MR. MANTLE FIELDING, ARCHITECT, PHILADELPHIA, PA.

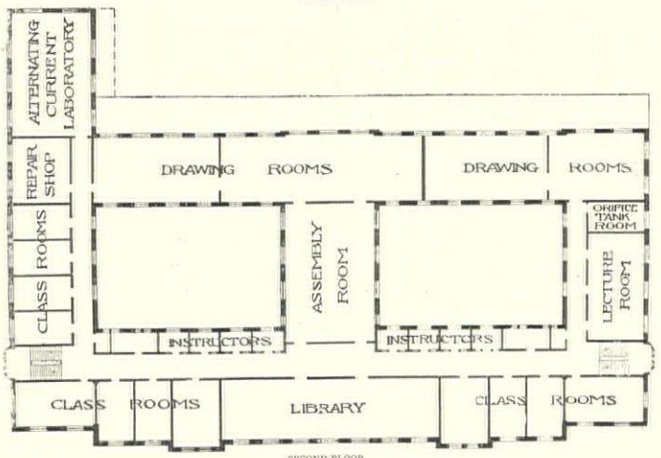
DOORWAY OF SAME HOUSE.

RENAISSANCE CAPITALS: PLATES 73-80.

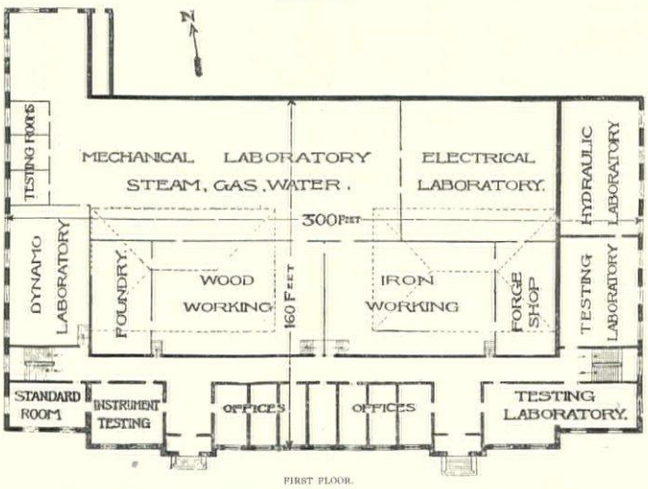
ENGINEERING BUILDING: UNIVERSITY OF PENNSYLVANIA, PA. MESSRS. COPE & STEWARDSON, ARCHITECTS, PHILADELPHIA, PA.



THIRD FLOOR.

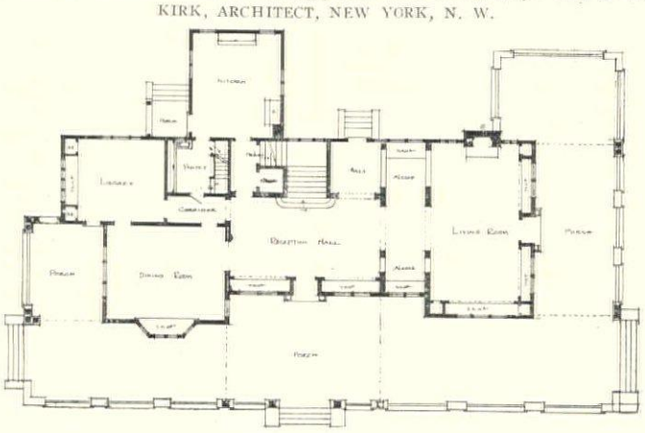


SECOND FLOOR.



FIRST FLOOR.

COTTAGE FOR M. W. NEWTON, ESQ., ATLANTIC CITY, N. J. MR. C. H. KIRK, ARCHITECT, NEW YORK, N. W.



Additional Illustrations in the International Edition.

THE MINT TOWER, AMSTERDAM, HOLLAND.

THE THIEF'S TOWER, LINDAU, BAVARIA.

This plate is copied from *Blätter für Architektur.*

THE POST-OFFICE, AMSTERDAM, HOLLAND.

THE MEAT MARKET, HAARLEM, HOLLAND.

NOTES AND CLIPPINGS

EUCHERING AN OBSTRUCTIVE TENANT.—At a recent meeting of the Ohio Engineering Society Mr. J. B. Strawn told how a building was reconstructed in spite of the opposition of an objecting tenant, as follows:

"In 1901 the Dollar Savings & Trust Company, of Youngstown, Ohio, had outgrown the old quarters. Architects were employed to prepare plans for an elegant new temple for the money-changers. The building is steel frame, is nine stories high above the basement, which is nine feet. It is provided with all known improvements, and some unknown. Before the construction of the new building could begin it was necessary to tear down the old building, which occupied a space about fifty feet square at the corner of Market street and the Public Square. This was a three-story brick building; the first floor was occupied by the Dollar Savings & Trust Company. The second floor was used for offices. A telephone exchange occupied a part of the third floor. The telephone company's lease would not expire for seven years. At this point the banking company ran up against a snag in the shape of a demand for thirty thousand dollars to vacate their rooms and surrender their lease. The architects for the new building 'took the bull by the horns.' The telephone company thought they had a dead sure thing of it. But they had reckoned without their host. The telephone exchange was permitted to remain, and the building went on all the same. The architects devised plans for sustaining so much of the third floor as was occupied by the telephone exchange by placing timbers under the third floor joists, and under these timbers were placed three rows of posts, of seven posts in each row. These posts extended to the bottom of excavation of basement of new building, which was thirteen feet below pavement line. The posts were fifty-one feet long, 10" x ", and were braced and counter-braced until the basement was a wilderness of posts, braces, ties and beams, all to the great annoyance of the engineer; for there was scarcely room to set up a transit or level in the basement. After the telephone exchange was firmly mounted upon its new legs, it was boarded in and roofed and covered over with roofing felt, and made water-proof and storm-proof. A passageway was built from the rooms out over the sidewalk to a point over the street curbing; thence down a flight of steps running parallel with the street curbing to the landing on the asphalt paving. Both passageway and stairs were neatly constructed, with roof similar to the rooms of the exchange, were lighted with windows for the day and electric lights by night. Thus things remained until the building was enclosed. The telephone company was scarcely interrupted or in any way annoyed while the work was in progress. When completed they were ensconced in, probably, the handsomest quarters of any telephone exchange in this country. The solution of this problem, complete, was accomplished with an outlay of $5,000, a net saving of $25,000.

THE FRENCHMAN.—One of the younger American architects who has studied in Paris enthuses after this fashion to a newspaper reporter:

"We are afraid of new ideas and prefer the beaten paths in art, while the Frenchman is an explorer, who astonishes and mystifies by the daring and novelty with which he presents his conception and his new point of view. Back of this is a profound mentality and an almost superhuman insight which can wrestle with and solve almost any problem. He differs from us and from the most of the world in that he has a mythology and a hierarchy, which he has made his own; and with this comes his gift of personifying abstract ideas, and of dedicating his work to the gods of Olympus rather than bringing it down to the level of poor humanity. From time immemorial this has been a necessary condition for the production of great art. The Frenchman, from this detached point of view, is able to paint, model and design magnificently, heroically and with perfect sincerity. His public understands him and his ideals, and rises to his plane in appreciation."

To all of which fine writing we feel like adding the simple comment, "Oh!"

THE REINFORCED-CONCRETE ACCIDENT AT BERN.—It appears from an inquiry held by experts on the disastrous fall of the Bern Theatre storehouse a year ago, that this was due to avoidable causes. The roof girders, 12.40 metres in the clear, crashed down with the ferro-concrete roof when the centring had been partially removed and caused regrettable loss of life. The inquiry held shows that the plans were insufficiently annotated and figured so that there resulted some misunderstanding between the architect and the contractors. Furthermore, the contractors appear to have taken some inexplicable steps; without consulting the architect, certain sections were altered in order to simplify the work, and thereby the construction was materially weakened; the centring was removed too suddenly and too soon, only twenty-five days having been allowed for the concrete to harden, instead of the minimum thirty days; neither iron nor concrete were tested, with the result that, on testing the concrete after the accident, none of it yielded the minimum resistance required, *i. e.*, 160 Kg/cm^2, while some of it showed only a strength of 82 Kg/cm^2; finally, the so-called movable supports to the main girders were rigid with rust, and as the concrete further adhered to the supporting walls there was no possibility of free expansion and contraction.—*The Builder.*

A WHISTLER ANECDOTE.—Mr. Frederick Kippel tells this amusing story of the always eccentric artist:

"Yet I myself was eye-witness to a curious bit of insincerity or artistic satire on his part in his own studio. The first day I spent with him he received a visit from a foreign artist, an old acquaintance, with whom he had not as yet quarrelled. After a cordial reception, one that seemed genuinely cordial, the visitor, artist-like, went about the studio looking at everything. He seemed especially charmed with a small picture, and after standing before it for some time remarked, 'Now, that is one of your good ones.'"

"'Don't look at it, dear boy,' said Whistler, airily. 'It's not finished.'

"'Finished!' exclaimed the visitor. 'Why, it is one of the most carefully finished pictures of yours I have ever seen.'

"'Don't look at it, dear boy,' persisted Whistler. 'You are doing injustice to yourself. You are doing injustice to my picture, and, what is more, you are doing injustice to me.'

"The visitor looked bewildered, but Whistler in a theatrical tone cried out, 'Stop, I will finish it now!'

"Whereupon he procured a very small camel's-hair brush, fixed it on a very long and slender handle, mixed the least little speck of paint on his palette, dipped the very tip of his brush into it, and then, standing off from his picture with the action of a fencer with his rapier, he made a forward thrust and touched the picture in one almost infinitesimal spot with his pigment.

"'Now it is finished,' he exclaimed, 'and you may look at it.'

"All this was highly dramatic and capitally acted, for, after all, it was acted, as what happened afterward shows. For, some time later, I met the foreign artist again, and he told me that he had left his umbrella behind him, and, calling for it the following morning, was told by the servant, who recognized him, that Mr. Whistler had gone out, but that he might go up to the studio and look for it. He found it, and also found out something else. For, stopping once more to look at the picture which had been 'finished' for his especial benefit the day before, he saw that the little dab of wet paint which Whistler had put on so dramatically had been scrupulously wiped off again.

PRICES AND BUYERS.—A terra-cotta tablet, which had been offered to the Metropolitan Museum for $50,000 as an example of Della Robbia ware, was removed yesterday from the place it has been occupying in the museum for the last few months. The negotiations and discussion which have arisen concerning this work have created some stir during the last few weeks. The tablet, which measures six feet by four, represents Christ in the Garden of Gethsemane. It was offered by an art-dealer of this city and Paris, to the Metropolitan Museum last April for the large sum of $50,000. It was later offered to one of the trustees of the museum for $11,000.—*New York Evening Post.*

The American Architect and Building News.

Vol. XC. SATURDAY, NOVEMBER 10, 1906. No. 1611.

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ONCE more an attempt is making to convince public officials who publish invitations to architects to submit plans and so forth for the erection of buildings they have been properly authorized to erect that there is thereby established between the municipality they represent and any or all architects who may in good faith accept the said invitation and comply with its conditions a complete and valid contract which the courts will uphold. Architects are frequently tempted to bring suit in cases where the recession from publicly made pledges, the apparent breach of an implied contract, has seemed particularly flagrant; sometimes they go so far as to take legal advice, but rarely is a suit actually brought, largely, we fancy, because in a given case no one feels like fighting a battle for other people, and because it seems a little invidious to assume that of all the disappointed contestants the plaintiff alone is the one who suffered damage. We have heard rumors of cases that were compromised, but we cannot at this writing recall many adjudications on the subject.

THOSE who watch such things have been aware that during the last two or three years the Boards of Education in several New Jersey towns have been having a most unhappy time. They have held competitions for school buildings, only to get into trouble with their expert-advisers, with their superior officials, the mayors of their several cities, or with their coordinate brothers, the aldermen; they have come into conflict with the official city architects and more recently with the State architect, and altogether have found themselves a sort of storm centre. We cannot state just what was the compelling cause of the action which has given Messrs. Rankin, Kellogg & Crane, of Philadelphia, grounds for bringing suit against the Board of Education of Newark, N. J., but the cause itself lies in the inability, or the unwillingness, of the Board to select for execution any of the plans submitted, at their published invitation, for the erection of a new Manual Training and Commercial High School building on the Wallace tract in said city. The invitation, which was duly published, December 14, 1905, offered amongst other things five prizes, and it is alleged in the complaint that though the plans submitted were duly examined, none was accepted, nor was any of the promised prizes paid. The architects accordingly bring suit for $20,000 for breach of implied contract.

"LIQUIDATED DAMAGES" is a little understood and very elastic phrase, and we suppose it may have application to this case, for it appears that the plaintiffs sue for $10,000 as the value of the drawings and so on, prepared at the invitation of the defendants, and for another $10,000 as damages, the sum, we suppose, being their estimate of the commission that would have been due them if they had carried their design into execution. Filed with their declaration is a schedule showing the value of the drawings prepared by them, the items revealing that Mr. Kellogg expended time and effort, computed at the rate of ten dollars per hour, to the value of $2,067.84, while Mr. Crane's expenditures only came to $825; the draughtsmen employed under them, however, were paid for their work the sum of $2,042.07, and the share of "office expenses" during the time the plans were in incubation added $2,960.94 to the total. These figures, which will interest the profession and certainly the ordinary business man, show that the cost price of the drawings was $7,895.85, and though it is less than the $10,000 sued for, there is still the factor of profit over cost to be considered. They should at least convince the court and jury that these suitors are particularly close accountants and carry on their business with the utmost strictness and method.

WE have for a long time been purposing to express ourselves upon the manner, extremely unwise and reprehensible, as we think it, in which architects bring suit against their former clients, and we may as well give voice in connection with this suit, though disclaiming the intention of treating the case as a text. In ordinary commercial life, it is a common, perhaps an unbroken, practice for a plaintiff in search of damages to sue for a sum that is vastly more than he hopes to be awarded, a sum that generally has no very close connection with the real value of the service he has rendered. This is done because a jury feels it can best exercise what it believes are its judicial powers by cutting down the damages it actually awards, and suitors find they must discount this fiction by bringing suit for far more than they expect the jury can be persuaded to award them. Perhaps there is no way of getting around this hoary obstacle, but we feel strongly that professional men should act under a higher code of honor than that which controls ordinary commercial affairs, and that their claims should never be overstated, not only for their own sake in the special case that concerns them, but for the sake of upholding the dignity and honor of the profession at large. Particularly is this so when the plaintiff rests his case in any degree on the "custom of the profession" and proposes to introduce in any way in his testimony the "schedule of charges" of the American Institute of Architects. It is a common practice with architectural suitors, a practice we incline to look on as a flagrant professional misdemeanor, to bring suit under the sched-

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ule of charges, in cases of abandonment, for a full three and one-half per cent. for complete working drawings, when the work actually prepared by the claimant hardly justifies a rating as more than preliminary sketches.

THE American Institute of Architects cannot, of course, forbid its members to bring suit until their briefs have been inspected and approved by the directors, but it can, and should, describe with extreme particularity just what the members and the public are to understand by "preliminary sketches," "general drawings," "working drawings," etc. Now that buildings are built so rapidly that an architect must have ready for instant use at the time the builder signs the contract a greater amount of drawings than used to be the case, it is really more reasonable that the larger part of his fee should be due and collectable at that time than it used to be, when he counted on doing a considerable proportion of his work as the building slowly progressed toward completion. This makes it all the more improper that a claim should, under the schedule of charges, be urged at law for all but superintendence, when the architect can actually show little more than quarter-scales; and yet on small work and particularly by young architects such claims are constantly put forward, and each time a suit improperly brought in this way is lost an injury is done to the standing of better instructed and more intelligent practitioners.

A JUDGMENT delivered by the Tribunal at Annecy, France, very clearly covers the point we have in mind. Here the court said: "If it is the general custom that there shall be allowed to architects for the preparation of plans and specifications for work not actually carried out a proportional commission of one and one-half per cent. on the estimated cost of the building, it is *only on the condition that the architect's work is wholly finished and ready to place in the contractors' hands.* If the specifications are incomplete and the list of quantities not sufficiently detailed, it is the court's duty to scale down the claim to a proper relation with the work actually done." Our point is that the architect's claim should be so fairly and accurately presented that neither court nor jury can find any reason for scaling it down. This French opinion we refer to includes another ruling that is curiously at odds with our practice, and shows how harshly the Code Napoléon bears on French architects. It declares that, in a case where suit is brought for commission due on abandoned work, the architect's commission must be computed exclusively on the amount of the estimate "accepted by the owner," while with us it is based on the figures received from the lowest responsible contractor, whether the same be acceptable to the owner or not.

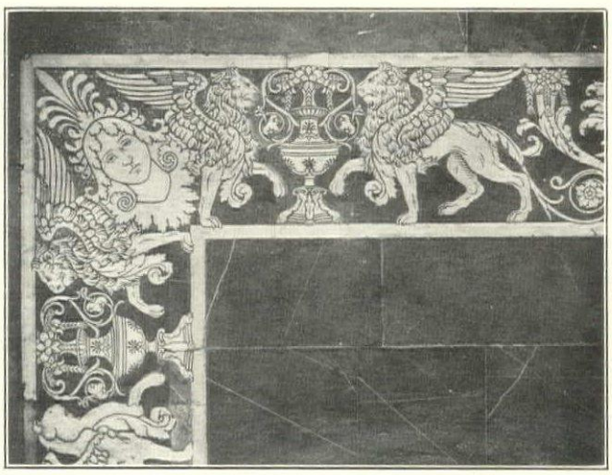
CONSIDERING the way the ordinary business man looks at things—with whom it is a common failing to feel that no one else has a right to make money save himself, it seems rather unfortunate—to revert once more to the New Jersey case—that he should have a chance to comment on the claim for "damages" in the sum of $10,000, or remark on the fact that busy architects can reckon their time as worth ten dollars an hour. It is only the other day that the American Institute of Architects was attacked in the chambers of the Cleveland City Council as an "architects' trust," whose members get "enormously big fees," and we think it well worth the Institute's while to make some distinct recommendations to its members as to the care and justice with which they bring their suits, and define with precision just what must be done by them to earn one percentage or another. The course adopted by Messrs. Peabody & Stearns, of Boston, in a case now pending, a course which might be described as a "flat rate" course, seems more likely to pass the scrutiny of a jury. Here the architects sue simply for $3,129, the proper charges for the work actually done by them, and yet the case was a more flagrant one than the Newark case, seeing that one school-committee of the town of Wellesley engaged them to build a grammar-school house, while the succeeding school-committee decided that the town needed a high-school building, not a grammar-school one, and forthwith employed a new architect to do so, refusing to honor their predecessors' agreement with Messrs. Peabody & Stearns.

ALTHOUGH the metric system was adopted in France as the standard system of measurement over one hundred years ago, and though by the law of 1837 those who persisted in using the old weights and measurements became liable to the imposition of a fine for each infraction of the law of 1795 and the seizure of the illegal scales and measures, as every one who has lived in France knows, the old system is adhered to with great tenacity by the common people and also by certain trades and classes of business men. The fact that this widespread custom exists in the country of origin of the metric system, after the lapse of more than a hundred years, clearly indicates that the old method has practical advantages that the new one does not possess, and also that the use of mixed methods of measurement in and by the same community does not produce the chaos that the advocates of the metric system allege must inevitably follow. It is annoying, of course, to the authorities to have themselves and their laws openly flouted, and it is embarrassing to the advocates of the metric system to have their arguments negated by observed facts, but no insufferable wrong appears to result, and the French Government appears more than half inclined to wink at the use of illegal measures and to no longer exact the prescribed penalties from those who use them. At any rate, the Minister of Commerce, Industry and Labor has lately addressed a circular to the Chambers of Commerce throughout the country asking them to use "some other means than those of repression" to induce offenders to use the metric system. In the course of his circular, he declares that "notwithstanding all its efforts, the Service for the Verification of Weights and Measures has not been able to accomplish this desired result." This should surely lend aid and comfort to our own manufacturers and business men who feel that the millions they now have invested in plants operated on the English system of measures are largely at the mercy of theoretical busybodies able to devote their time to securing compulsory, as they already have secured the permissive, legislation that will force the metric system on American business men.

THE ARTISTIC PAVEMENTS OF ITALY.—III.

TUSCANY, which in the thirteenth century was glorified by the two superb pavements I have mentioned, now demands attention because of the pavement in the cathedral at Siena, here very fairly illustrated. This was begun in the fourteenth century. Although this marvelous creation belongs to the Renaissance, I can speak of it here because the name of Duccio di Boninsegna, the grandfather of the Sienese painter, is associated with the creators of the

DETAIL OF PAVEMENT IN SIENA CATHEDRAL.



DETAIL OF PAVEMENT IN SIENA CATHEDRAL.

pavement. The earlier mention of Duccio is dated 1282—he was born in 1260—and the latest 1339, and Vasari assures us that Duccio made the first cartoons for the pavement. This legend of Vasari's was repeated many times, but it should be rejected, seeing that prior to 1369 there exists no mention of the

"JUDITH SAVING BETHULIA": PAVEMENT OF SIENA CATHEDRAL.

pavement. All the documents were examined and collated several years ago by G. Milanesi in his "*Documenti d'Arte Senese*," from which we must infer that Vasari wrote on very uncertain data, and we know that from 1517 to 1546 the Sienese pavement had the attention of a noted Sienese painter, Domenico de Pace Beccafumi (1486-1551), called Mecherino or Mecarino, who was its chief author.

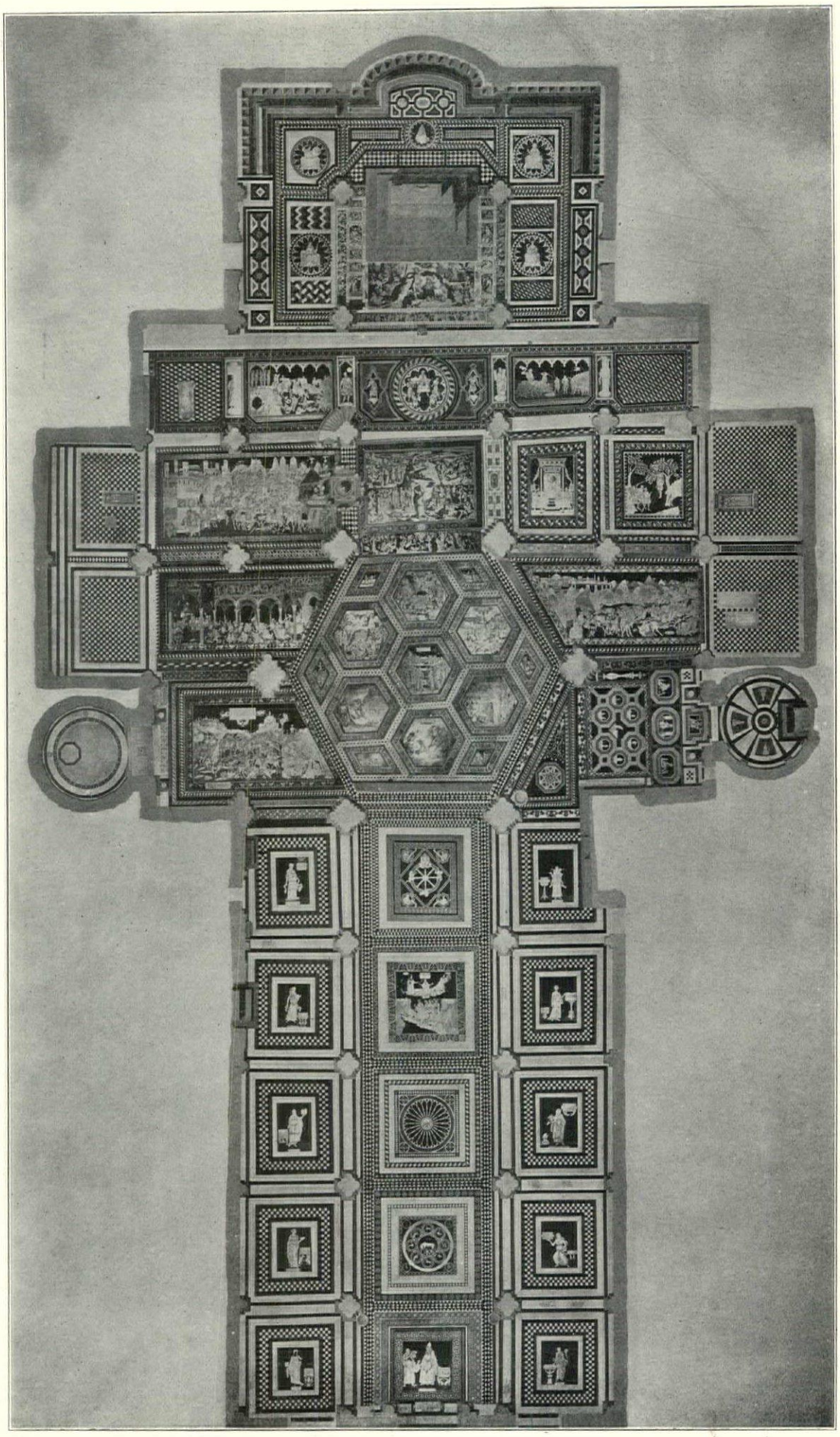
Before Beccafumi, whose name made famous Sienese art during the Renaissance, the eminent Bernardino Pintoricchio (1454-1513) had a hand in its design in 1505, and it is to be remarked that the Sienese pavement in its time occupied the attention of a host of artists. For example, there was in the beginning, in 1369, Antonio di Brunaccio, and after him, in 1370, there was Sano di Marco; then came Franceso di Bartolomeo Landi, Guidoccio Gozzarelli, Matteo di Giovanni Bartoli, and Benvenuto di Giovanni del Guasta, who was in charge of the pavement in 1485.

Milanesi got together a number of documents bearing on the work of these artists, but new researches throw more

"THE FABLE OF FORTUNA": PAVEMENT OF SIENA CATHEDRAL.

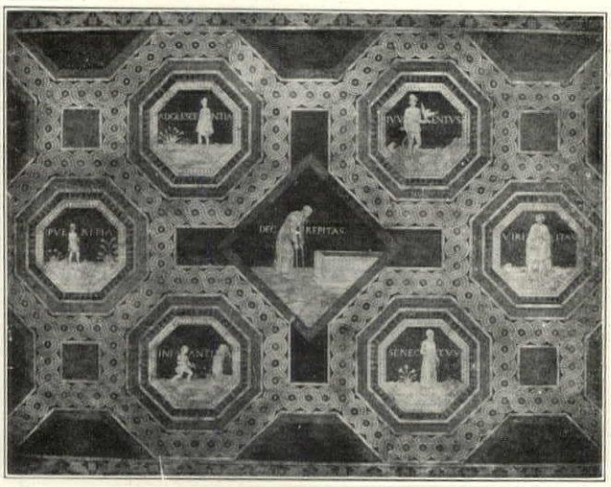
light on the history of the pavement at Siena and show that it is redundant with figures and names, and, moreover, that it continues down to our own times.

In the last half of the eighteenth century this Sienese pavement had its artists; for instance, a certain Carlo Amidei, a



THE PAVEMENT OF SIENA CATHEDRAL: FROM A DRAWING MADE IN 1884 BY SIG. G. PACIARELLI, AND NOW IN THE OPERA OF THE CATHEDRAL.

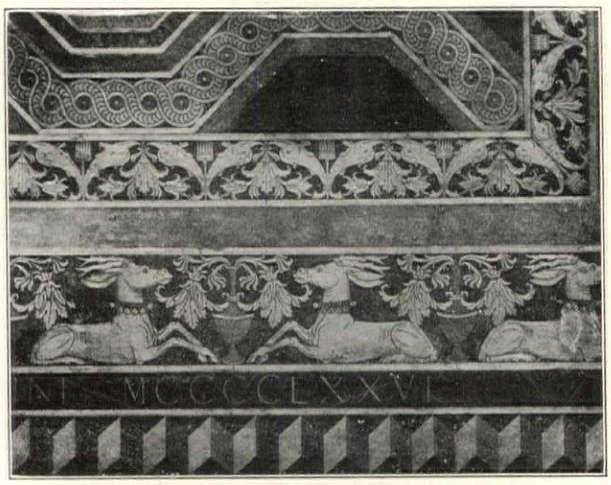
painter, who was desirous of continuing the stories in the little compartments with work that was of less than medium worth. The credit of having worthily finished this side of the pavement belongs to my friend Andrea Franchi, a Sienese painter, who in 1877 made the cartoons for the parts executed in our own day.



"THE SEVEN AGES OF MAN": PAVEMENT OF SIENA CATHEDRAL.

This marvelous pavement consists of a surface of marble on which are engraved ornamental bands and storied scenes. The graved lines are filled in with a black material and the figures have a chiaroscura effected sometimes by lines and sometimes by means of white or gray marble. With the black there is also used at times a little red, and these few tints produce effects that, whether energetic or elusive, are always artistic.

The figure-embellished pavement in Siena cathedral is a monarch in its class. Neither Italy nor the whole world can show another like it, but there is little temptation to imitate it. At Siena they have been obliged, for the sake of preserving those *chefs d'ouvre* to place over the storied panels wooden tables which do not at all comport with their beauty and richness. So if anyone wishes to examine the pavement of Siena Cathedral he must pay a handsome *pour-boire* to induce the vergers and their helpers to uncover the more interesting portions, the public being allowed to see, free of charge, only the wooden coverings and some of the less important portions of the pavement itself.



DETAIL OF PAVEMENT IN SIENA CATHEDRAL.

Tuscany, proud as it is of the pavement at Siena, can also boast of another of some importance in the cathedral at Lucca, to which the name of Matteo Civitali, one of the most lovable of Renaissance artist-sculptors, lends *éclat;* almost destroyed, it was restored in the eighteenth century. Tuscany can also show numerous funereal or memorial flaggings which adorn several churches which might be listed here alongside mosaic pavements proper. Thus S. Croce at Florence is extremely well supplied with decorations of this class. The typical treatment shows a floral design surrounding the family escutcheon, with a frieze running the length of the rectangular panel, together with mottoes and inscriptions in black lettering on a white marble background. There are other kinds in S. Croce, where the design is carried out in relief, but they cannot be considered now.

Besides S. Croce one should visit in Florence, in search of these mortuary decorations, Sta. Maria Novella, and, outside the city of Dante and Michael Angelo, should visit S. Franceso and S. Domenico at Pistoja and Sta. Maria della Pieve at Arezzo, and, seeing that the ornamentists of the early Renaissance knew how in admirable fashion to handle such designs, I think my readers shoould be put *au courant* with the fact.

The Renaissance would inspire me to write many pages, and this would draw me away from the artistic pavements in mosaic which I have undertaken to consider here. The Quattrocento and the Cinquecento would lead me to a consideration of pavements in majolica, of which Siena has some remarkable examples in Sta. Caterina, and in the Capella Docci in S. Francesco of which the provenance is unknown to me. There used to be one, too, in the Palazzo Magnifico, and the one in S. Agostino should be mentioned. Pavements of this kind may be found in many Italian cities: Venice, Padua, Milan, Bologna, Parma, Nonantola, Perugia, Spello, Viterbo, Rome, Naples—particularly in Naples, where one should visit S. Giovanni à Carbonara, Sta. Caterina à Formello, S. Pietro à Maiella, S. Lorenzo, Sta. Maria delle Grazie à Caponapoli, the one-time monastery of Donnalbina and the present monastery of Sta. Maria Donnaregina, and Capua. But this flowery path would lead too far afield, and perhaps I have already made my readers overweary with my talk about artistic pavements. If not, perhaps at some later time I may take up the matter of the pavements that belong to Renaissance and modern times.

ALFREDO MELANI.

BUILDING IN EARTHQUAKE COUNTRIES.[1]—I.

I AM going to address you on the principles that govern the art of building in countries subject to earthquake shock, and this with the object, in the first place, of showing that one can, and therefore ought, diminish in a notable degree—by two-thirds at least—the damage resulting from seismic shock. A distressing and recent event, the disaster at San Francisco, seems to impose on me the duty of drawing attention to this problem, since, attracted to it more than twenty years ago in consequence of a prolonged residence in one of the most disturbed portions of the globe, Central America, I have probably given more attention than any one to a minute comparison of the conditions of site and construction which, in the case of numberless shocks, have brought it about that a certain structure has stood uninjured while its neighbor has fallen in upon its occupants, or that, in a city wrecked by earthquake, certain quarters remained unaffected while others were destroyed. I beg you to note that, over and above theoretical speculation, I shall cite only the results of actual past experience and the conscientious examination of accounts of great seismic disturbances, guided always by the safeguarding precept that if theories fly away observed facts still remain.

It is all the more needful to inform those populations that are interested that there are means of avoiding the peril, because we find American contractors undertaking, with imperturbable *sang-froid* and a pluck as admirable as it is inconsiderate, the reconstruction of the "Queen of the Pacific," without taking too much trouble to provide for a relative security that may easily be had—at least, if the news that comes to us over the Atlantic may be relied on. In France, even, earthquake dangers are not to be disregarded, as is found proved when one recalls how the Côte d'Azur suffered, February 23, 1887, and how Gouraya, in Algeria, was ruined, January 15, 1891. Unhappily, on both sides of the Mediterranean rebuilding has been carried out on as improper lines as before, and future punishment for this fault cannot be escaped; the earthquake has its appointed hour, and so we Frenchmen should seriously concern ourselves with this matter.

In countries subject to earthquake, contractors and builders have to consider not only the constant force that acts and reacts vertically, due to weight of material; they must also provide against numerous horizontal undulations and vertical vibrations.

[1] A paper read at the Thirty-fourth Annual Congress of the Société Centrale des Architectes Français by M. le Commandant Montessus de Ballore, graduate of the Ecole Polytechnique.

The propagation of these movements at the level of the ground is measured by kilometers per second, their periodicity by seconds, their amplitude of oscillation by decimeters, and they impart to terrestrial particles an acceleration of several meters per second. These figures account for the magnitude of the disaster inflicted on buildings by these great earth tremblings. And this is not all; account must also be taken, in the case of ground of slight coherency, of veritable waves several feet in height, during the rapid passage of which the ground takes on for the moment all the properties of a liquid, like the surface of a sea ruffled by the wind. These conditions are so complex that all theorizing is illusory. But, happily, observation remains to us, and this enables us to define the methods of construction that are best and able in a large degree to resist these suddenly applied forces. There evidently are such methods, since there is no known example of a city absolutely destroyed by earthquake. It is a matter of course that, even if a large measure of safety can be assured to buildings, there are limits that no one can have the pretension of exceeding. In the case of great earthquakes we find the ground not only splitting, cracking and slipping, but also sinking in an amount and to a degree that defy all human prevision. Thus on October 28, 1891, there was opened in Central Japan a fault that had a length of 160 kilometers, while in places the level on one side was twenty meters and more lower than that of the other side. Man will always be powerless in face of such a convulsion; it would be folly to think otherwise. It would be no less foolish to hope to be able to check and control the tidal waves that have seismic or volcanic origin and are able to carry great ships miles inland, as happened August 26, 1883, at the Strait of Sonda. But within limits the function of applied seismology is of much value, for, taking one year with another, the number of earthquake victims cannot be less than several thousand annually. It is only against minor upheavals that there is any chance of providing a sure protection for the populations that are subjected to them, the disturbances being always of the same nature and occurring periodically, although at intervals that science cannot predetermine.

It would be logical to begin with a study of the effect of earthquake on the ground itself, but this would carry us too far afield, and we must leave that inquiry to the treatises on seismology. I shall content myself with considering, sketchily, the following matters, without entering much into detail: (1) Choice of site; (2) Materials and methods of construction that should be condemned; (3) Effect of earthquake shock on the elements of buildings; (4) Effect of earthquakes upon inhabitants of buildings; (5) General preventive means and needful city ordinances. The first matter to be considered by a builder is the site, and it is one of capital importance. In any case, the rules to be observed are not very precise. They really call for a profound examination, but, since in the case of a given town it is always the same sections that are affected, mere experience is often all the guide that is needed.

In a general way, soft ground is the most dangerous, for only in its case are produced those visible waves of which mention is made above; yet to advise that the bottoms of valleys, alluival plains and volcanic dejecta should be avoided is not unnecessary, since, in the holy name of theory, this recommendation has sometimes been opposed, it being argued that the incoherence of the soil would allow buildings erected thereon to smoothly follow any movement in it, a theory which has been repeatedly contradicted by experience. The line of junction between soils of different kinds should be avoided, since the layers of which they respectively consist vibrate at different rates and the building twitched about unevenly must fall to pieces. River banks, escarpments of all kinds and steep slopes are very dangerous, because the terrestrial particles oscillate freely, just as the last member of a file of schoolboys is overthrown when the first member is shoved violently. This explains, too, how it is that the first and last of a row of houses suffer more than do those between them, which mutually stay one another.

In general, slopes of any degree are to be avoided, for here, more than elsewhere, the soil is likely to have been subjected to the disaggregating effects of erosion and denudation: frequently they are covered with mere incoherent detrital material.

There remain, then, elevations with compact soils. These, in fact, are recommended by experience, but they should not be too high, else they will oscillate like a sort of inverted pendulum and the amplitude of oscillation at the summit often may be disastrously great. All discordances between one layer and another and, as a rule, all geological accidents are to be condemned.

Discussion of particular cases, useful as it might be, cannot be undertaken here. But it is always possible, through the study of earlier disasters in ancient cities, to determine the quarters that should be abandoned, for there are some which, to the exclusion of others, are devastated by each succeeding shock. This is shown by what took place at Norcia following the shock of December 22, 1859. There are, too, entire cities whose removal is imperatively demanded, and the story of the displacements of certain Spanish-American cities in their search for a safe site is very curious; their inhabitants have finally been content with an empirical solution of the problem, accepting it as solved when they found their city standing after a violent earthquake shock. Such, however, is not the case with San Francisco, whose destruction, after all, was due rather to fire than to seismic disturbance.

It is an elementary precaution to employ only materials of the best quality and then carefully watch over the manner of their use. The countries lying about the Mediterranean, from Spain to Italy and Greece, from Asia Minor to Syria and Algeria, constantly suffer because of the heedlessness of their inhabitants in these two particulars. So true is this that in those places inhabited by mixed races one often can, in advance, predict what portions of the town will suffer most, predicating the opinion on the different racial characteristics of their inhabitants. Thus, on March 6, 1867, the Turkish buildings in Mitylene were more generally thrown down than those built by the more careful Greeks. In 1838 a great conflagration swept over Charleston, and in the haste of rebuilding the people discontinued the use of a most admirable lime, made by burning the shells which the surf cast up on the beaches. In place of this, they made use of a lean lime imported from the Northern States. At the same time builders neglected the proper bonding of their brickwork. These two grave faults cost the city dear, on August 31, 1886. It is needless here to develop this aspect of my topic any further, and, besides, there are buildings of Classic antiquity that still stand in countries that are preeminently non-stable, which show that by adhering strictly to the ordinary rules of good building we make an excellent beginning, for have not these buildings been able to endure without weakening the onslaught of countless earthquakes during more than twenty centuries? This means that the fever for hasty speculative building that raged, and still rages, along the Côte d-Azur, for instance, is most responsible. We had proof of this on February 23, 1887, when we saw modern villas crumble away, while older and better built buildings about them stood uninjured.

(To be continued.)

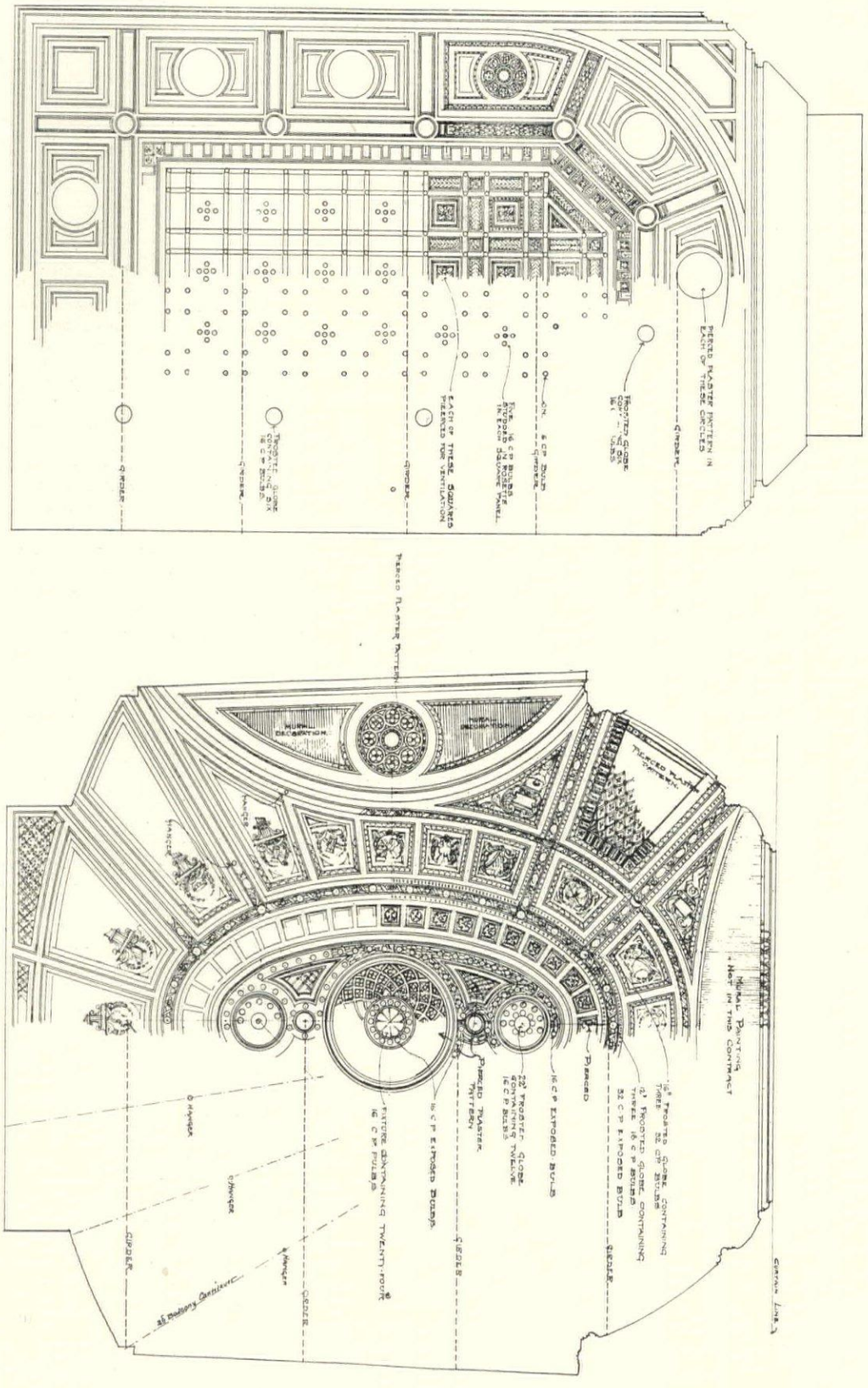
ILLUSTRATIONS

BROOKLYN ACADEMY OF MUSIC, LAFAYETTE AVENUE, ASHLAND PLACE AND ST. FELIX STREET, BROOKLYN, N. Y. MESSRS. HERTS & TALLANT, ARCHITECTS, NEW YORK.

THE building as designed will cover the liberal ground space of 183 by 215 feet, and will be 82 feet in height and extend, beside, 20 feet in depth below the sidewalk level. Passing through an attractive vestibule, 174 by 36 feet in size and extending the whole length of the frontage on Lafayette avenue, between Ashland place and St. Felix street, the audience will enter to the right the large auditorium, which will serve, though in a far more convenient way, all the purposes of the old Academy of Music, as opera-house, music-hall, theater and public forum; while on the left will be the smaller hall for concerts and ordinary lectures. The seating capacity of the larger hall will be 2,217, and of the smaller, 1,406. The building will also contain a smaller lecture-hall with a seating capacity of 409, besides a banquet-hall or ball-room 126 by 40 feet, offices, etc. The scheme of decoration is at once simple and attractive. All the arrangements and appliances for the safety, comfort, and convenience of the audience are of the most modern description. The building will be surrounded on every side by open spaces and will be of fireproof construction, with broad halls and ample exits.

The lowest bidder on the approved plans is the firm of John Thatcher & Son, whose bid was for the sum of $899,430.

The amount which has been expended up to date in the purchase of land, payment of architects and for minor expenses is $295,000. The cost of furnishings, not included in the bid of the contractor, is estimated at $100,000; and the payments still to be made to the architects and for minor expenses will amount to at least



CEILING TREATMENT: BROOKLYN ACADEMY OF MUSIC, BROOKLYN, N. Y.

MESSRS. HERTS & TALLANT, ARCHITECTS.

$40,000. On this basis the sum of $1,300,000 will be needed to complete the building according to the plans as they now stand.

The amount of $763,000 has already been subscribed. The capital that was authorized by special charter of the company is $1,000,000.

SIDE ELEVATION OF THE SAME.

GROUND PLAN OF THE SAME.

MEZZANINE FLOOR PLAN OF THE SAME.

TRANSVERSE SECTION OF THE SAME.

SECTION THROUGH LOBBY AND FOYER OF THE SAME.

LONGITUDINAL SECTION THROUGH MUSIC-HALL OF THE SAME.

LONGITUDINAL SECTION THROUGH THEATER OF THE SAME.

Additional Illustrations in the International Edition.

"SMITH DOORWAY": NEW DORMITORY, UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA, PA. MESSRS. COPE & STEWARDSON, ARCHITECTS, PHILADELPHIA, PA.

"COXE DOORWAY" IN SAME DORMITORY.

NOTES AND CLIPPINGS

A "Calendar" House.—One of the best known houses in Northamptonshire, England, was designed to represent the days, weeks and quarters of the year. It had four wings facing the four quarters of the heavens to represent the four quarters of the year; 365 windows, one for each day; fifty-two chimneys, one for each week, and seven entrances, to represent the seven days of the week.—*Exchange.*

The Passing of Two Paris Prisons.—The two ancient and famous prisons of La Roquette, for youthful offenders, and St. Lazare, for women, are to be pulled down and reconstructed close to the fortifications on the extreme verge of the city. The reason is that both prisons are built on old-fashioned and unsanitary plans and are not at all suited to up-to-date requirements. St. Lazare was founded in 1632 by St. Vincent de Paul as a mission convent. It was at first proposed to re-erect the prisons outside the city boundary altogether, but, as the expense would still have fallen upon the city council, they would not undertake the responsibility.—*New York American.*

Aluminium Wires for Long-Distance Transmission.—Aluminium lines are employed for some of the longest electrical transmissions in America. Until the recent earthquake in California the longest single line, that from Electra power-house to San Francisco, a distance of 154 miles, made use of aluminium as the only conductor. The 144-mile transmission between Colgate and Oakland is carried out with three aluminium and three copper wires. For the third transmission in point of length, that from Shawinigan Falls to Montreal, a distance of eighty-five miles, three aluminium conductors are employed. From these examples it may be seen that copper has lost its former place as the only conductor to be seriously considered for transmission circuits. Aluminium has not only disputed this claim for copper, but has actually gained the most conspicuous place in long transmission lines. This victory of aluminium has been won in hard competition. The decisive factor has been that of cost for a circuit of given length and resistance.—*New York Herald.*

"The Voices of the Bells."—After reading a review of Lafcadio Hearn's *"Some Chinese Ghosts,"* a friend sends to the "Clerk of the Day" the following letter:

The enclosed clipping from the Boston *Transcript* of last night calls to mind a story which you ought to have. Here it is:

Scene—A gathering of scientific men in Boston; the guest, Professor Mitsukuri, of the Imperial University of Tokio; among those present Professor E. S. Morse, of Salem, the well-known Japanophil, whose vigorous language is familiar to all his friends. Professor Mitsukuri tells the following story:

"In Japan we have a superstition connected with the casting of bells which runs that if human blood be allowed to drop into the molten metal the bell cast from it will, in one way or another, partake of the character of him from whose veins the blood was drawn. On my journey here I passed from Vancouver over the Canadian Pacific road and spent several days of the trip with Sir William Van Horne. We talked much of Japan, and this myth of our people came up. Sir William told me that while Professor Morse was connected with our University he explored everything Japanese, and among other places visited one of our bell-foundries. He was there told of this belief, and with his characteristic impetuosity drew forth his penknife, cut his finger and let the blood flow into the crucible.

"This story at once explained to me the mysterious peculiarities of a bell not far from our University, whose note, as I heard it ring day after day, filled me with curiosity and wonder, so unlike was it to any other Japanese bell. When it rang, instead of notes, indicative, in one way or another, of our national character such as all other bells in the neighborhood had, this one pealed out loudly, excitedly, one might almost say profanely, the reiterated syllables, 'Damn! Damn! Damn!'"

Though I have seen fit to reproduce this letter, knowing Professor Morse's keen sense of humor and enjoyment of a joke at his own expense, you aren't to imagine I believe it. I have given it publicity, merely to show what groundless yarns get spread abroad about even the best of us, and to warn the reader that he must walk circumspectly in this wicked world lest a like fate befall him.

Opposition to Holyrood Chapel's Restoration.—The late Lord Levens's bequest of $250,000 for the restoration of the Chapel Royal of King Edward's Palace of Holyrood, in Edinburgh, has evoked a storm of protest from the people, not only in Scotland but also in England, against any interference with the impressive ruins of the old abbey church. The latter was originally a structure of great size and fine architecture. It consisted of a nave, choir and transepts, with aisles. It is believed that there was a Lady Chapel to the east, and that there were two western towers, and a tower over the crossing. All that remain, however, are the ruins of the nave and one western tower. The transepts and choir have vanished, and it is not proposed to rebuild them. It is proposed that the partly demolished walls and the interior of the nave shall be rebuilt in accordance with the original design. The chapel played a great rôle in the drama of Scottish history. Mary Queen of Scots and Darnley were married there. Charles I. was there crowned King of Scotland, and many of the Stuart kings and consorts were buried there. But their tombs were desecrated and their remains scattered when the abbey was plundered and burned by a mob driven to frenzy by King James II.'s action in causing mass to be solemnized within its precincts. Since then the ruins have become one of the most picturesque and imposing landmarks of the Scottish capital, and there seems to be a very general feeling that it would be an act of vandalism to sacrifice one stone of these ancient and hoary ruins for even the most splendid restoration, especially as there can be no restoration that does not entail some destruction. Some, indeed, even go so far as to declare that this proposal to interfere with the Chapel Royal at Holyrood recalls to them Sir Walter Scott's well-known story of how the drummer for a patent stain-remover endeavored to obliterate the time-honored traces of the blood of the murdered minstrel Rizzio on the floor of the boudoir of his royal mistress, Mary Queen of Scots. Here again the settlement of the controversy rests with King Edward. It is for him to determine whether the chapel is to be restored or not, with the $250,000 bequeathed by the late Lord Levens for the purpose, and it may safely be asserted that whichever way he decides he will excite ill will, protest and denunciation. Should the restoration take place, it is proposed that the sacred edifice should be used as the chapel for the Royal Scotch Order of the Thistle. That, indeed, was the intention of Lord Levens, and as the Knights of the Garter have their chapel at St. George's, Windsor, the Knights of the Bath in Westminster Abbey, the Knights of St. Michael and St. George in St. Paul's Cathedral, and the Knights of the Order of St. Patrick in St. Patrick's Cathedral in Dublin, it would seem only right and proper that the Knights of the "Most Ancient and Most Noble Order of the Thistle," consisting of sixteen Scotch nobles and of several of the royal princes, should have once more their chapel in the old Abbey Church of Holyrood, where their respective banners hanging above their carved wood stalls would add a picturesque feature to the chapel. —*Marquise de Fontenoy, in New York Tribune.*

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THE lengthening roll of disaster involved in the attempt to use reinforced-concrete had another item added to it, late last week, when a large part of the Bixby Hotel, at Long Beach, Cal., collapsed without warning, causing the death of nine of the workmen and the serious injury of as many more. In view of the fact that the building was erected practically on the beach itself, it does not seem improbable that the beach sand, which must have been used liberally, had something to do with the weakness of the concrete mixture, which seems to be indicated by the extent and completeness of the collapse. It is rather notable that so many of these failures of reinforced-concrete involve buildings of considerable size rather than small ones, and the natural inference to draw from this, supposing that equal skill has been expended on each class, is that some common factor is at fault in each case, and, as we have hinted before, we suspect that this common factor is nothing more nor less than the slavish American veneration for speed. Where units are modest in size, spans moderate in dimensions and masses and the consequent weights not immoderately great, the instinct of well-trained building mechanics may fairly be counted on to afford themselves and their fellows satisfactory protection, even when engaged in carrying on building operations after what, to them, is a novel and untried system. But as the scale of the operation and the weight and area of the units increase so does the peril arising from the actual unfamiliarity of the mechanics employed with the material and system. The argument, so attractive to investors, that cost can be reduced through the employment of "cheap labor" is to some degree fallacious, as many a man has felt within the last year or two, as he gazed at his useless heap of reinforced-concrete débris. The owner who, in these times, when there are few architects, engineers or builders who can claim to have had real experience in concrete building, puts a time-limit into his contract, enforceable with a penalty, is quite likely to have serious cause for regret.

NEW YORK architects, at least, will watch with much interest and some equanimity the steps that the Corporation Counsel promises to take in his attempt to recover for public use the space between the building-line and the stoop-line on Fifth Avenue, which, for a couple of generations, has, it seems, been illegally availed of by the abutters to the prejudice of the public. Justice O'Gorman, of the Supreme Court, has recently handed down a decision that the Knickerbocker Trust Company is a trespasser on the public property and must move back to the building-line the steps, platform and columns that now invade public territory. If it were not that there is a very distinct traffic need of widening the roadway of Fifth Avenue, it is probable that the authorities would be content with a mere legal victory and a judicial determination of the city's rights in the premises. They could, perhaps, afford to wink at present infractions, which have been innocent in purpose and have had the sanction, mistaken to be sure, of aldermanic approbation, while guarding against any future encroachments. But the need of widening the roadway is so imperative and the chance that the present trespassers could gain anything by appealing to the higher courts is so remote, that it may be accepted as a foregone conclusion that, within a year or two, there will be found no trespassers beyond the building-line on Fifth Avenue. This will lead to so considerable a rebuilding of frontages that it will inevitably hasten the transformation of Fifth Avenue, below the Park, into an exclusively commercial street, and, though many householders could afford to stay there, we may before long see the W. K. Vanderbilt house taken down stone by stone and re-erected in some quieter neighborhood.

THE fall meeting of the National Academy of Design this week, the first since its coalition with the Society of American Artists was effected, was peculiarly interesting, because the first balloting for new members made possible by the terms of the merger was to take place, and architects, at least, were interested to discover whether any of the twenty-five places provided for architects would be filled. It was taken for granted that Mr. McKim, who has for some time, we believe, been an Associate and the only architect who enjoyed that distinction, would be advanced to the full grade of Academician, but the election resulted in giving him as companion Associates Messrs. Walter Cook, Cass Gilbert, Thomas Hastings and George B. Post, all of New York. As architecture is the mother of the arts, it would seem rather curious that, by the terms of the revised constitution, there may be only twenty-five architect Academicians, while there may be five times as many painters; but it must be remembered that the Academy of Design was founded primarily as a society of painters.

Entered at the Post-Office at New York as second-class matter.

INTERNATIONAL exhibitions have been for so long practically great architectural exhibitions, the design and treatment of the great buildings, the layout and landscaping of the grounds and the exhibits of reconstructed historic buildings having quite as much to do in drawing the supporting crowds as the varied products of trade, manufacture and art housed within them, that we think it has been quite wise to abandon the idea of holding a great "architectural exhibition" in Vienna in 1908. The proposed character of the exhibition, not the exhibition itself, has been abandoned, for, in place of one devoted specifically to architecture, there is to be held one that will show what progress Austria has made in all the arts and industries during the sixty years of Franz-Josef's reign.

SOME ingenious statistician in an idle moment has figured out that the entire population of the globe could, at the same instant, find convenient standing-room on the little Isle of Wight, and, as this country is several times larger than that beautiful Channel island, it seems to us that the editor of *The Builders' Journal* is needlessly apprehensive when he warns British architects and draughtsmen who are considering the advisability of emigrating to this country that it "is, perhaps, doubtful if they would at first be welcomed, practising on their own account, because the ordinary American citizen is rather antagonistic to the Britisher, though the German, the Austrian and the Pole are welcomed with open arms." The "ordinary American citizen" should feel complimented that any one can believe him so literate as to be more fluent in high and low German and Polish than in his native tongue. But, bless the man, does he really fancy that American architects are in spasms, because Mr. Henry Vaughan, an amiable Englishman, who has practised, and very successfully, for many years in Boston, and Mr. George F. Bodley, R.A., a still more eminent Englishman, who, until now, has found it more agreeable to remain at home, have been selected without competition as joint architects for the Episcopal Cathedral that is to be built at Washington?

EVERYONE must have noticed, in accounts given of the recent earthquake by those long resident in San Francisco, how commonly it was said that the writer took refuge in the open doorway of his chamber and how variously this common action was accounted for when an alien reporter asked for an explanation. The two reasons most commonly given were that the framework of the doors made that portion of the wall stronger than any other, which might or might not be so, according to circumstances, but about which the ordinary citizen was not competent to form an opinion, and secondly it was a known fact that plaster ceilings fell into the middle of the rooms. If the seeking of this refuge was not a matter of the mere blind impulse to escape, followed by instant misgiving as to whether safety was to be found outdoors rather than in, we are inclined to think that it may have been so common a thing in San Francisco to find a door "stuck" because of some distortion due to a slight *"temblor"* that it was everyone's first impulse to find out whether the way of escape was open or whether the door was already stuck and himsef a prisoner.

THE naval architect, it seems, sometimes finds as much trouble in collecting his pay as any of his brothers whose arks have never yet been launched on the bosom of the flood. Mr. Charles Herreshoff, a member of the well-known family of yacht-builders, has recently been obliged to sue a client in the sum of twenty-five hundred dollars, the same being said to be due for designing a fifty-foot power launch. The case, which is undecided at this writing, deserves watching by terrestrial architects, as we must call them in contradistinction, for almost any of their clients might set up as good a plea as that which Mr. Herreshoff's lawyers must overcome. The client declines to accept, and consequently to pay for, the launch, on the ground that its engines were imperfect and unsatisfactory. The architect contends that he was employed only to design the launch itself, and it is quite immaterial to him whether the engines, which, however, were built by engine-builders of highest reputation, run satisfactorily or not. Of course the decision of the case will turn on the actual conditions of the contract that can be proved to exist, but it suggests the possibility that an architect who has designed a mill-building might be denied payment because the machinists had not set up their shafting perfectly true, or a hotel-building architect might find his family threatened with starvation because the ranges in his latest production "wouldn't bake."

ONCE more we are reminded of the cosmopolitanism of American art, or rather, to put it better, are reminded by the death of Mr. Samuel J. Kitson, which occurred in New York last week, of how much what passes for American art is really the accomplishment of men born, bred and educated in other countries. American writers on art would never consent nor to include in their roll of American artists West, Whistler, Boughton, Vedder, Sargent, Abbey, Story, Powers, Hughes, Ball, and a host of practically expatriated Americans, a large part of whose training was acquired, and certainly the best part of whose work was performed, outside of this country. The classification would not be unreasonable, if the same writers did not claim as American art the output of the still larger host of foreign artists whom fate has led to practise within our boundaries. One of these artists was Mr. Kitson, a sculptor, who, born in Huddersfield, England, in 1848, came to this country at the age of thirty-three and had the good fortune, shortly after his arrival, to be commissioned to carry out a considerable part of the sculptural work in the house of Mr. W. K. Vanderbilt, on Fifth Avenue, New York. Perhaps his most important work was the frieze he executed for the Memorial Arch in the Capitol Park at Hartford, Conn., a work whose merits attracted far more attention at the time of its erection than they would now. He also executed a considerable number of portrait busts and bas-reliefs of much merit.

BUILDING IN EARTHQUAKE COUNTRIES.[1]—II.

WE shall have to be content with a somewhat cursory consideration of the more important elements of a building, especially of those whose destruction would involve the entire building in complete or serious disaster.

It has been determined in Japan, through direct seismometric experiment, that the movement is notably less at the bottom of a well from three to eight meters deep, consequently we find the chances of resisting successfully improving the deeper we sink our foundations, which should be made continuous under all parts of the building. In soft ground there is much to be gained by the use of inverted segmental arches and vaults, making a platform over the entire site.

A radical solution consists in wholly suppressing the foundation. This is what the Japanese have done from time immemorial, their light buildings being essentially framework boxes, resting at the corners on large stones. When a shock occurs, the building pitches off these stones, but as the fall is not great the structure is not seriously deformed and the damage is easily made good. They have even improved on this method by supporting their buildings on cannon-balls, which themselves rest on a concrete platform. Unfortunately, this solution, elegant as it is, is of real use only in the case of simple cottages.

Walls should be absolutely homogeneous and consist of materials having the same density. At Mitylene, for example, where two kinds of lava stone were used, it was noticed that the tremors had started all stones of the heavier kind, so that they protruded beyond the face of the wall, which was in consequence disaggregated. Only stones with rough surfaces should be used; cobble-stones and smooth pasture-stones should be rejected. Volcanic rock is generally to be preferred to sedimentary. Rubble-work is better than cut-stone work, as this suffers dislocation through slipping in proportion as the beds and builds are more smoothly dressed. In connection with walls, there is one matter of the highest importance: If the shock attacks them in the line of their length they will be subjected to compression and extension; if, on the other hand, the shock exerts itself perpendicularly to their face, they are in danger of overthrow. As partition-walls have the support of the outer walls, it is to the latter that attention must be given. Therefore, in a given city subject to earthquake, the longer walls of a building should be laid parallel with the direction of the earthquake movement as established by observation of past shocks. It is certain that in San Francisco the main thoroughfares ran in the most dangerous direction that could have been selected. In the checker-board cities of Spanish-America, the dangerous directions are well known, and, to equalize the damage in two series of streets, it has sometimes been proposed that the buildings should face on the diagonal, a suggestion that is obviously foolish.

Openings should have the most careful attention, for in a façade they form two series of lines, one horizontal, the other perpendicular, which offer the least resistance, and it is this that causes the destruction of the wall. It is well known that cracks always start from the angles of door and window openings. The shape of the upper part of such openings has a great deal to do with the destructability of a wall, and in an ascending scale, so far as concerns security, they may be listed as follows: Lintel, segmental arch, full-centered arch, pointed arch. The simple lintel should be condemned absolutely.

Floors and ceilings never vibrate synchronously with the walls, and this is a chief cause of disaster. To remedy the evil, so far as possible, walls and floors should be bonded to one another as firmly as possible, so that each room in a house may become an indeformable solid. The very reverse of this treatment has been suggested, the complete independence of walls and floors, with free play at the chases. In this case each element of the building vibrates for its own account; but the arrangement presents too many serious technical difficulties.

The destruction of chimneys by shocks of even moderate violence reaches enormous proportions. The Charleston earthquake in 1886, a severe one, to be sure, destroyed 95 per cent. of the 14,000 chimneys in the city. Not only is their fall dangerous to people in the street, but roofs are seriously damaged at the point of juncture with them. For every reason, they ought to be built wholly independent of the rest of the structure; then they can oscillate freely, and run no risk of being cut off at the roof level because of difference of synchronism with the building's own movement.

All projecting or overhanging architectural features are to be condemned. This is to be regretted from an esthetic point of view, but there is no way of avoiding the necessity. The mere presence of such features is the worst of dangers for the building itself, which without them might, perhaps, resist a shock.

Vaults, those important architectonic members, are also unavoidably doomed to destruction. Built to resist vertical strains, they are quite unable to resist the horizontal force of earth movements; their abutments are forced in and the arch opens.

The Classic or pitched roof, by its mere presence, often causes the destruction of dwelling-houses. If it be well built, it constitutes a practically indeformable whole, which, jumping up and down under the impulsion of vertical vibrations, falls back upon the supporting walls of the building and shatters them, while itself often reaches the ground in little injured condition. It is plain, then, that such a roof should be inseparably united with the rest of the building. Sometimes when the shocks are not heavy enough to do any other damage the vibrations are serious enough to cause tiles and slates to slip from the roof onto the heads of those who have just rashly rushed into the streets. This particular danger can be avoided in several ways, one of them being the giving the roof at the eaves the distinct upward curve that the Chinese give their roofs, for the sake of keeping dislodged tiles from dropping into the street. The effect of such roofs, once one becomes accustomed to them, is artistic enough.

The amplitude of seismic movement at the level of the first floor is at least three times as great as that at the level of the ground floor. From this one can judge what it is at the level of a fourth or fifth floor and what it is going to be in the thirty-fourth story of an American skyscraper.

The combination of a church tower with the roof covering the nave is eminently an unstable one, because of the lack of synchronism in their oscillations. It is hardly useful to suggest that the tower should be built independent of the church, so unsatisfactory artistically is this solution which has often been adopted in southern Italy. It is needful, then, to suppress all ties between the two parts of the building, disguising their absence in the most practicable way. As to the height of such towers, height in itself, if other precautions are properly taken, does not constitute a danger. It is worth suggesting that by giving the interior of the tower a circular form on plan it will be brought into excellent condition, for, though the vault is a deplorable element of construction when its axis is horizontal, it acquires admirable qualities of earthquake resistance when its axis is vertical. This peculiarity of the vault deserves consideration, for, in the case of foundations, horizontal arches, or vaults, can be of much service, as is shown by one incident out of a thousand that might be cited. During the earthquake of 1670 a great vault at Antigua, Guatemala, was thrown down horizontally, as it were, and rested on the ground uninjured. It has successfully resisted many shocks since, particularly the very severe one of July 20, 1773.

Japanese seismologists have very carefully studied the matter of earthquakes and railroad bridges, for by the shock of October 28, 1891, many of the bridges of their new railway system, then building, were overthrown. Bridges in the East Indies suffered in the same way under the shock of June 12, 1897. The fact is, simply, that their superstructure acts on the piers just as roofs affect the supporting walls of a building. Besides, being built often on incoherent alluvial soil they are peculiarly exposed to the effect of those visible earthquake waves already mentioned, and of the reality of which the earthquake of April 18, 1902, left so visible a proof at Ocos on the Pacific coast of Guatemala. After the shock had passed, a long wharf was seen to have been left in long and high undulations, well marked and of equal dimensions; some of the piles had sunk, while those of the next bent had risen. The elasticity of the structure had not, however, been great enough to restore it to its original form, and so it stood there, congealed as it were, in its strange deformation. The same effect was noted in a bridge across a neighboring river. Bridge-builders, therefore, ought to give especial attention to the perfect tying of the floor to the piers, to which should be given a parabolic profile, the form that is recognized as offering most resistance to efforts of simultaneous overthrow and rupture, the form, be it noted, that assures stability to the Eiffel Tower. Since these precautions have been adopted, Japanese railroad bridges have resisted several violent shocks. Railroads themselves are so large a source of wealth for a nation that they should not be left unconsidered. Under the influence of seismic vibration railway lines warp and twist horizontally in the most capricious

[1] A paper read at the Thirty-fourth Congress of the Société Centrale des Architectes Français by M. le Commandant Montessus de Ballore, graduate of the Ecole Polytechnique.

fashion, and this over great lengths. From the standpoint of seismology proper, much is to be learned by studying their manner of destruction. Thus, when, after the shock of December 20, 1892, at Old Chaman in Beloochistan, they set about relaying the line, they discovered that a length of some fifty meters of rail had been shortened by about eighty centimeters, and this throws a light on the genesis of earth tremors, since the earth itself must have been compressed to the same amount. Here is a fact that one must take account of when laying the foundation of a building, and the use of vaults with vertical axis, as mentioned above, is evidently a measure that one can employ to resist the danger.

As for water and gas mains, which seem such secondary elements of construction, their powers of resistance are of much importance, as was shown at San Francisco. Their rupture was the chief factor in a vast disaster which did not seem to be justified by the magnitude of the actual earth movements. It was the conflagration that ensued that caused almost all the damage. This conflagration seems, in part, to have been caused by gas escaping from ruptured mains and coming in contact with furnace fires and so on. Further, the rupturing of the water-mains not only did not leave pressure enough in the pipes for the firemen, but by escaping into excavations and the cellars of partly injured buildings brought about the downfall of these by undermining. There is little doubt that study will show how similar disaster may be escaped in future.

So far as conflagration goes, the peril that accompanies the earthquake, there have often been those in Japan to which the San Francisco disaster is not to be compared. Thus, on October 28, 1891, Kasamatsu, down to the last house, was burned, and at Gifu 2,225 houses out of a total of 5,852 were burned, and at the same time 3,000 persons perished in the flames. It is true that the light Japanese house with its paper partitions is peculiarly dangerous when its fragments come in contact with a brand left burning on the domestic hearth. Practically all that has been done by the Japanese to ward off future disaster is to offer a reward for the invention of a kerosene lamp that would extinguish itself on being overturned. I do not know what the result has been, but the effect cannot be very beneficial, so long as the Japanese house remains such as it has always been.

(*To be continued.*)

THE VALPARAISO EARTHQUAKE.

SO little definite knowledge of the effect of the earthquake at Valparaiso has come to hand that we are glad to be able to reprint the following letter from Mr. George L. Duval, Treasurer of the Merchants' Association, who was on his way to Chili at the time of the disaster:

"THE published reports and illustrations of the havoc wrought by the earthquake will give but an inadequate idea of the character and extent of the damage done. One must see it in its entirety to appreciate the devastation. The old, original, part of Valparaiso was located upon solid ground on the only section of the bay partly sheltered from the violent northerly winds, which expose the shipping and water-front to great damage every winter. This section, called the Port, enlarged by reclaiming lands from the bay, is the fiscal, financial, and commercial centre. The Custom House, Government stores, courts, post office, City Hall, the banks, and large foreign houses are here located. Except in isolated instances buildings erected on natural land in the Port have escaped destruction, while those constructed on the reclaimed land are badly shattered. Thus, our building on the land side of the Calle Blanco is one of the oldest in Valparaiso, reinforced by heavy Oregon-pine timber and steel beams, and remains intact, while across the street Williamson, Balfour & Co. have had to desert their office, and Duncan, Fox & Co. have replaced the front and rear walls, which fell, by temporary coverings of galvanized iron.

"The damage by the earthquake throughout the zone affected has been in proportion to the character of the soil built upon and the character of construction. Immunity for many years from serious shocks developed carelessness in construction which has now paid the penalty. From the central plaza, "de la Victoria," south and east, covering the entire district known as the Almendral and Bella Vista, the prospect is the most dreary imaginable. Here and there some insignificant buildings which capriciously escaped only emphasize the appearance of desolation. In this district fire finished whatever the earthquake spared. It spread over fully one-quarter of the area and it is impossible to estimate the relative damage.

"The bay front of the Almendral and Bella Vista district and extending back for an average of a quarter of a mile to the Calle Victoria, the central thoroughfare, gave its modern character to Valparaiso. Here entire blocks of solid three and four-story stone structures had been erected in the past twelve or fifteen years, all of which have been totally destroyed. From the Calle Victoria back to the hills, an average width of a quarter of a mile, was the populated part of the city on the plane where the poorer classes were crowded in. This became the scene of the greatest distress. The former inhabitants have appropriated every available open space on which, with the assistance of the authorities and relief committees, shacks of wood and galvanized iron have been erected and are the homes to-day of about 50,000 people, a good proportion of whom are accustomed to genteel and even luxurious surroundings.

"It is not the poorer classes who have suffered most from the disaster, as they, being provided with shelter, food and clothing, for the time being, are in little worse condition than they were before, and have, besides, the certainty of plenty of work at good wages. The great burden really falls upon the middle class, on a vast number of clerks and employés whose savings were invested in their homes, which are now destroyed, and on the shopkeepers who lost everything.

"The hill residential section, where the more opulent foreign colony dwells, was not badly damaged, although many families lost their homes and are now doubled up with their neighbors. The neighboring cemetery hill seems to have been a focus of the shock. No tomb or monument escaped serious injury; most of them are wrecked and the niches employed by families having no plot of their own, situated on the brow of the hill, were undermined, and, with their contents, fell to the plain.

"The earthquake-clause in the insurance policies almost certainly exempts the companies from claim for damage by fire which immediately followed the earthquake. The companies; however, make the formal announcement that they will not respond for any claims whatever, holding that all the fires were caused by the earthquake. It is expected, nevertheless, that they will be obliged to differentiate and pay at least a portion of the loss by fire which occurred several days after the earthquake and after the original fires were under control. These later fires are variously ascribed to short-circuits on resuming electric service, smouldering cinders and to incendiaries; but, whatever the cause may be, the companies will doubtless find that the payment of these losses is a good basis of compromise and the best means of demonstrating the value of insurance to many who are rendered skeptical by the general repudiation as announced.

"The Welicias section, in the southeast extremity of the plain, was badly shattered and shows enormous damage by earthquake only. The more southern extension, at the Baron section, shows scarcely a sign of commotion, and thence for a stretch of three or four miles there is little evidence of disturbance until reaching the suburban sections of Miramar (slightly affected), Vina del Mar (seven miles from the port, badly shaken), Poblacion Vergara, Chorrillos, and Miraflores, a succession of ruins leaving hundreds of families homeless.

"In San Francisco the damage by earthquake and by fire was estimated at 1 to 9, respectively. Here I should say the reverse will hold. The fire-department is voluntary, but efficient, and, but for the breaking of the water-mains, would undoubtedly have checked the flames. The new water system of Valparaiso is highly efficient, but the mains could not withstand such a rude shaking. They were set right, however, in forty-eight hours, and in complete working order four days after the catastrophe, which is a very creditable showing.

"The wonderful work done by Captain Luis Gomez Carreno of the Chilian navy, who was vested with supreme command under martial law, in maintaining order and establishing sanitary conditions, has drawn unstinted praise from all classes. The emergency developed the man. Captain Carreno has been ordered away to recuperate his health after the severe strain of the last six weeks without rest.

"An inspection which I made some days ago of the principal encampment on the Avenida Brasil, where destitute thousands of all classes are temporarily housed, disclosed conditions of surprising care and cleanliness, a guaranty against sickness and epidemic which many feared as the worst effect of the disaster.

"Coming down the coast, the reports of lawlessness and horrors immediately following the earthquake were sensational but in the main unfounded. There were looters, as there were in San

Francisco, but they were summarily dealt with by Captain Gomez. Some fifteen or twenty were shot. Reports magnified this to 500. The resolute hope and cheerfulness of the people, Chilians and foreigners alike, is amazing and encouraging. It doubtless reflects the conditions which followed the calamity in San Francisco and shows a creditable spirit of emulation.

"The Government plans to expropriate the ruined district, and either to lay out broad avenues and parks, disposing of the remainder at prices which will probably recoup the entire outlay, or to employ part of it in building a sheltered port instead of carrying out the Krause scheme of a new port, which is of doubtful feasibility. The objection to this plan of a port in the Almendral is that the entrance to the new port would be in the most exposed part of the bay, and that it would mean the relinquishment of the present Custom House and big public stores, and would measurably contract an already limited plane which the importance of Valparaiso has outgrown. Another plan, to build the sheltered port under the hills in the extreme northwest of the port district, is favored by many because it would have a maximum of natural protection from the northerly winds, preserve the existing conditions as to Government buildings, and make of the wrecked district a valuable shopping and residential section. Whichever plan is adopted, the Valparaiso of the future is sure to be a more attractive place than the Valparaiso of the past, and the great resources of the country and its phenomenal prosperity for the past five years will justify the cost."

THE PROPOSED EXCAVATION OF HERCULANEUM[1]

AGAIN we have received reports from Rome that the plan of Herculaneum is nearing its realization, and that the for excavating and scientifically exploring the ancient city almost unsurmountable difficulties which have stood in the way will soon be removed. It is a most gigantic undertaking, and, if successful, promises to throw a light of the most far-reaching importance upon our knowledge of Classical antiquity. For beneath the subterranean ruins of this ancient city there will undoubtedly be found the most invaluable treasures of ancient art and literature, which have lain buried there for almost two thousand years.

Herculaneum, which in the first century of our era was destroyed simultaneously with Pompeii by an eruption of Vesuvius, has been but very little explored, and for the most part remains untouched. While we are familiar with every nook and corner of Pompeii, its streets, its parks and its gardens, its temples, its theatres and its baths, its houses, its stores and its factories; while we know the rank and occupation of its inhabitants, and, in some cases, their very names, and can follow them in their daily callings to the ballot-box, to the temple, to the Forum, of Herculaneum we know next to nothing, because the difficulties which confront the excavator are here unusually great.

One of the great difficulties which stand in the way is that the modern city of Resina lies exactly over the ancient city of Herculaneum. It is indeed often the case in making archæological excavations that later structures have to be removed. Thus, in connection with the French excavations in Delphi it was necessary to remove a whole village that had grown up on the ruins of the old city. And at Didyma, in Asia Minor, where the work is in the hands of the Germans, the committee in charge is at the present moment engaged in buying up the whole city of Jerunda and moving its inhabitants to another place. But in Herculaneum the thing assumes infinitely greater proportions. The mere fact that Resina is a city of no less than 20,000 inhabitants is in itself a difficulty of no mean importance. But even greater difficulties are caused by the fact that Herculaneum lies not only much farther below the present level than Pompeii, but that the mass of matter which covers it, although composed of the same material as that which covers Pompeii, and ejected almost at the same time, is infinitely more difficult to remove.

When Vesuvius became active on the 24th of August in the year 79 A.D., the masses of volcanic matter which had been thrown up by former unrecorded explosions, and which had lodged around the edge of the crater, became dislodged by the accompanying earthquakes, fell into the crater and were immediately thrown out again with great force. A strong northwest wind drove the mass of brimstone and ashes in the form of a large black cloud toward and over Pompeii. The wind, however, was not able to hold up the heavy substances for any length of time, and the result was a heavy shower of brimstone which covered Pompeii and the surrounding districts to the depth of two or three yards with pieces of brimstone as large as pigeons' eggs. After this fall of lapilli, as these pieces of brimstone are called, came an equal quantity of ashes, and after the ashes and partly with it came floods of rain which changed the top layer of ashes into a mass of mud, which later became hard and formed a firm crust over the whole.

The same masses of lapilli and ashes had but a few hours before burned Herculaneum, but they did not fall one after the other, but at the same time, and were accompanied with copious showers of rain. So much water fell that the lapilli and ashes which fell on the slopes of the mountain became a stream of mud, which poured down the mountain over Herculaneum and, with the masses which fell in the city itself, covered the whole place twenty to thirty yards deep. It is often asserted that a stream of lava flowed over Herculaneum, but this is not in accordance with the facts any more than the general idea that the matter erupted was glowing hot, thus causing a general conflagration which destroyed everything in the two cities.

Herculaneum was, therefore, buried much deeper than Pompeii, but more important still is the fact that the lapilli and ashes, which contained quantities of sulphur, chloride of iron, and other chemical compounds, were saturated with the water and formed a kind of mortar which in the course of time dried out, solidified, and became as hard as stone. Thus the whole city lies, as it were, embedded in cement, and must be hewn out of the rock.

This is the chief difficulty which presents itself in exploring Herculaneum. And, indeed, it is of such gigantic proportions that there are some who seriously question whether the results of a systematic excavation of the ancient city would justify the great sacrifices it would involve, especially since Pompeii, which represents the same epoch, is so well known.

To this question the large majority of archæologists, who are always enthusiastic whenever there is a prospect of a new relic, answer in the most unequivocal terms: "Yes, yes, the results would more than justify the sacrifices of money and labor. Herculaneum owes science much information which it has withheld these nineteen centuries. The time has come to make it speak. And when it does speak it will tell us much which Pompeii has left untold." In Pompeii, Vesuvius did not do its work thoroughly enough. When, after the twenty-sixth of August, '79, the earth became quieter and the fugitive inhabitants of the destroyed cities ventured to return to the neighborhood of Vesuvius to search out the ruins of their houses, Herculaneum had disappeared utterly from the face of the earth, but in Pompeii the higher parts of the houses stood out above the ashes, and everybody was able to find his own house. It was comparatively easy to dig down some distance, to remove the ashes and the light, porous brimstone beneath it, to break through the walls between the rooms, to hide what could be hidden, and to remove the valuables and other things which could still be used. Hence, a house is rarely found in Pompeii which had not been ransacked immediately after the catastrophe. And this explains the comparatively small number of household utensils, ornaments and coined money which have been found there. Large and valuable works of art, statues, bronzes, and the like, were, naturally, also removed. In fact, they even dug for building material, the stones of the larger buildings, the tiles, even whole rows of pillars were carried away, so that but little remains of the marble buildings around the Forum.

In Herculaneum, on the other hand, such a general plundering was impossible. Everything remains just as it was after its destruction, so that here we shall get a very much larger collection of works of art, household utensils and other objects used in daily life.

Herculaneum, too, was a much more important city than Pompeii. The latter was a small provincial commercial town without a library and without any notable works of art or literature. In the excavations of Pompeii, we could not, therefore, expect to find any treasures of great importance. In Herculaneum it was otherwise. It was a fashionable summer residence of wealthy Romans with beautiful villas. Agrippina herself had her villa here.

The following incident will show how much may be expected from a complete excavation of Herculaneum. During the reign of Charles III. of Naples, in the year 1738, a certain baker was digging a well, and the king took advantage of the opportunity to look for treasures. A villa was uncovered from which he secured no less than 1,700 manuscripts. The owner of the villa, moreover, had been a specialist interested in the late Epicurean

[1] Translated and adapted by the *Boston Transcript* from *Berliner Tageblatt* and *Neue Freie Presse.*

philosophy, and the manuscripts which were found in his villa treated of this subject. There can be no doubt that a thorough excavation would bring to light a greater store of treasures than have yet been found anywhere. We might find Classical writings which have been lost either as a whole or in part; perhaps missing parts of Æschylus, Livy, or Tacitus. It is even possible that some of the buried Herculaneum books may give information about the very beginnings of Christianity.

These, then, are some of the difficulties and the advantages connected with the proposed excavations of this ancient city.

Professor Charles Waldstein, the well-known English archæologist, is at present at the head of the movement. He has been agitating the question for some three or four years. He has succeeded in interesting not a few men of wealth and prominence in his scheme, and has, moreover, the promised cooperation of most of the nations. Professor Waldstein's idea is to make the excavation of Herculaneum an international affair.

Professor Waldstein is very earnest in his desire to do nothing to needlessly offend the Italian Government, which has always been inclined to resent any interference with its treasures, be they buried or otherwsie. With reference to this question, Professor Waldstein says: "Herculaneum ought not to be dug out by strangers, but under the direction of Italy. And if the work is done by international cooperation, it ought to be done in such a way that none of the recovered objects be carried out of the country. For this purpose national committees should be formed in every civilized country, to consist not of archæologists, but of men of prominence representing the nation. The head of each country, the king or the president, should be at the head of the committee, which should be composed of statesmen, financiers and military men. The international committee should be composed of two representatives from every land, one of whom shall be the ambassador of that country in Rome. The king of Italy shall be the head of this international committee."

So much for Professor Waldstein's plan, which may be somewhat chimerical. The professor, however, is no dreamer. In his private life he is an enthusiastic sportsman, an accomplished horseman. In his public life he is a hustler, who does things. He has interviewed and won over to his plan, among others, Emperor William of Germany, President Roosevelt and the President of France, each of whom has expressed his willingness to head the committee for his own nation. Even the King of Italy himself has expressed his approval and promised his cooperation.

But the plan cannot be realized until the full consent of the Italian ministry has been secured. As soon as this consent has been given—and it is now almost hourly expected—Professor Waldstein will proceed with soliciting funds. He estimates a yearly expense of about one million francs.

OVERCROWDING IN NEW YORK.

THE forthcoming issue of *Federation*, the quarterly publication of the Federation of Churches and Christian Organizations in New York City, will contain a paper on the city's populous and densest blocks, prepared by Harold M. Finley, a "federation annuitant" from Yale University. With the omission of some elaborate tables of figures, parts of the paper are as follows:

A careful study of the "Report of the Enumeration of the Inhabitants of the State of New York," for 1905, reveals that there are in the Borough of Manhattan no less than fifty-one blocks with populations of over 3,000 inhabitants each. . . . The most populous is not on the lower East Side, as might be supposed, but on the West Side, two blocks west of Central Park. This is the block bounded by West Sixty-first Street, Amsterdam Avenue, West Sixty-second Street, and West End Avenue, with a population of 6,173 people, living on 5.392 acres.

Of the fifty-one blocks having more than 3,000 population, thirty-seven are on the lower East Side below Fourteenth Street; seven on the East Side above Fourteenth Street, six on the West Side, and one in the middle area now called "Fifth Avenue Federation districts."

It is explained that the term "Federation districts" is now applied to the old Assembly districts, the boundaries of which are still used in the statistics of the organization. Mr. Finley continues:

The Sixteenth, Fourteenth, and Fourth Federation districts, on the lower East Side, are, of course, the principal offenders in the matter of congestion. When we discover, however, that fourteen of these blocks are not on the lower East Side, it is evident that the disease is spreading. The Sixteenth Federation district alone includes twelve blocks of 3,000 population. Four of these have densities of over 1,100 people to the acre. The Fourth Federation district contains nine of the blocks, three of which have densities of 1,100. The Fourteenth Federation district has six; the Tenth, four; the Sixth, three; the Second, two, and the Twelfth, one. The Twenty-sixth and Thirty-second Federation districts in the upper East Side have two each; the Thirty-third, three. The Seventeenth, on the West Side, has three; the Nineteenth, two, and the Fifteenth, one. The Thirty-first has one.

In 1900 the combined population of these fifty-one blocks was 132,881, or an average of 2,605 people to the block. In 1905 the total population had mounted to 177,988, the block average to 3,490. This was a total increase of 45,107, and an average increase per block of 884. These figures represent an actual total increase in five years of 34 per cent. During the same five years the Borough of Manhattan increased in population from 1,850,093 to 2,112,380, an addition in population of 262,287 people, or 14 per cent. What do these figures mean? They mean that during these five years the percentage of increase in blocks already wofully overcrowded was more than double that of the total of the borough. They mean, further, that 17 per cent. of the total increase of population in the Borough of Manhattan between the years 1900 and 1905 is constituted of the increase of these fifty-one blocks alone.

In 1900 the block bounded by Second and Third Streets, Avenue B to Avenue C, with 4,105 population, was the most populous in Manhattan, and the "honors" were with the Sixteenth Assembly district and the lower East Side. To-day this block, with 5,036, must be contented with second place. Two other lower East Side blocks, bounded by Catherine, Madison, Market and Henry, and by Fifth Street, Avenue D, Sixth Street and Avenue C, have passed the 4,105 mark of 1900. The block third in population to-day lies, not on the lower East Side, but between One Hundred and Twelfth and One Hundred and Thirteenth Streets, and First and Second Avenues, far up on the upper East Side—an Italian section. This block has had a mushroom growth that is astonishing. From a population of 822, and a density of 183 in 1900, it has grown to a population of 4,325 and a density of 961 in 1905.

Following is the list of twelve blocks of the fifty-one with densities of over 1,100 to the acre:

	Density. 1905.	Density. 1900.
Cherry-Jefferson-Monroe-Rutgers	1,458	1,000
Cherry-Clinton-Monroe-Jefferson	1,422	1,171
Fortythe-E. Houston-Chrystie-Stanton	1,301	913
Clinton-Stanton-Suffolk-Rivington	1,291	818
Rivington-Sheriff-Stanton-Willett	1,273	1,133
Cherry-Montgomery-Monroe-Clinton	1,218	703
Rivington-Willett-Stanton-Pitt	1,203	1,190
Rivington-Columbia-Stanton-Sheriff	1,172	772
Rivington-Goerck-Stanton-Lewis	1,163	980
West Sixty-first-Amsterdam Avenue-West Sixty-second-West End Avenue	1,145	553
Elizabeth-East Houston-Mott-Prince	1,108	1,025
East Second-Avenue C-Avenue B	1,104	900

The total area represented by our fifty-one populous blocks is 208.645 acres. The average density of these blocks in 1900 was 642. In 1905 this average had increased to 860. In 1905 twelve of these blocks had densities of over 1,100, while in 1900 there were only four. . . . The one Fifth Avenue district block of 3,000 population has the lowest density to be found among the fifty-one blocks. This block, bounded by One Hundred and Seventeenth, One Hundred and Eighteenth Streets, Fifth Avenue, and Lenox Avenue, is suggestive of the time when Harlem, too, will have her quota of populous blocks.

The present density of the last-named block is 524 to the acre.

ELY CATHEDRAL.

"THIS week at Ely," says a writer in *Black and White*, under date of October 20, "has been commemorated 800th anniversary of the dedication of the present building of Ely Cathedral, when also took place the second translation of the body of the founder, Etheldreda, the Queen Abbess, from the Convent Church.

"Many are the legends and stories that cluster around a building like Ely Cathedral, which has witnessed the nation's history for more than twelve centuries, and whose influence is seen to this

day in the speech of our country by the word 'tawdry.' Among the legends connected with the life of St. Etheldreda is that of Bryhstan. He in sickness pledged himself to a religious life on recovery, but was thrown into prison on account of his wealth. To him, as the legend goes, after continual prayers to Etheldreda, the saints appear and the prison chains are broken. Queen Matilda, wife of Henry I., wished to retain the iron collar, but this Bryhstan hangs on the shrine of Etheldreda when he enters her monastery of the Benedictine order at Ely. There the chains seem to have remained a cause for much reverence, and probably of superstition; while it became the custom of the monks to give to pilgrims as a memento of their visit miniature shackles like those of Bryhstan. These are the 'St. Awdrey Chains' which later degenerated into plaited (tawdry = t'Awdrey) ribbons. Hence the adjective was used for personal ornaments, showy but common, and is a corruption of the saint's name—Æthedrythe, Etheldreda, Eldreda, Aldreda, St. Aldred, St. Awdrey.

"The glory of Ely Cathedral is the Gothic dome and lantern, so aptly styled St. Awdrey's Crown. This is that which makes the great minster of the fens so utterly unlike any other church in England, or, indeed, in Christendom, both in the stateliness and the variety of its outline.

"The lantern was the result of a catastrophe which became a blessing in disguise through the constructive genius of one man, that greatest of the English cathedral builders of the fourteenth century, Alan de Walsingham, sacrist and afterward abbot of the foundation. On February 22, 1322, the old Norman central tower, erected by Abbot Simeon just after the Conquest, fell as the monks were returning from the church to their dormitory. Alan is represented in the old records as being at first perplexed and overwhelmed, not knowing which way to turn himself or what to do for the reparation of such a ruin; but, taking courage and putting his whole trust in God, he set his hand to the work, clearing the spot with all possible speed and with much labor and expense. He then measured out eight positions in which the eight stone columns were to stand, supporting the new campanile. These spots he caused to be dug out and examined until he had found the solid rock. Alan's main object was to build up something that should be less likely to fall than the traditional centre tower borne up by four arches. Cupolas of the East, as well as towers of the West, were formerly supported by four arches, and so could have no greater span than the four limbs gave. The peculiarity of the Ely octagon is that the central space is far wider than any of the four limbs, which, from other points of view, look so vast, but sink into mere adjuncts to the great central space."

ILLUSTRATIONS

THE NATIONAL ARTS CLUB STUDIO BUILDING, EAST 19TH STREET, NEW YORK, N. Y. MESSRS. GEORGE B. POST & SONS, ARCHITECTS, NEW YORK, N. Y.: FIVE PLATES.

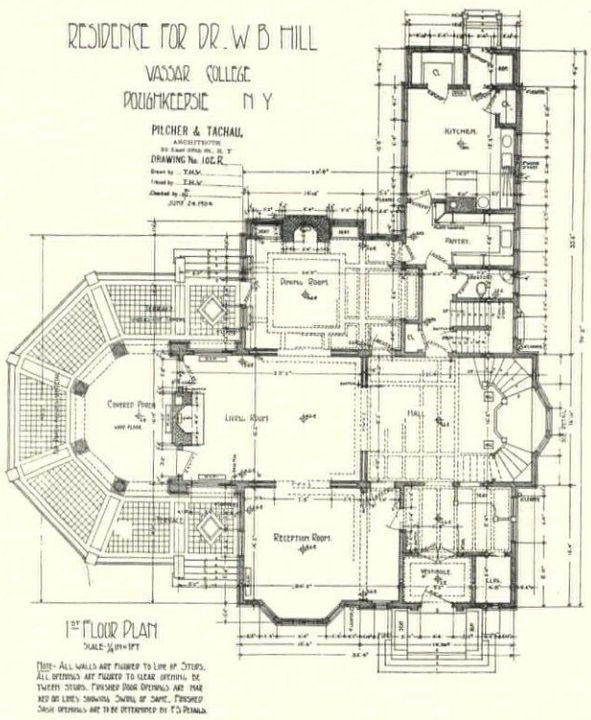
The new studio club-house of the National Arts Club, composed of the old Tilden and Pelton houses, at Nos. 14 and 15 Gramercy Park, and the new fifteen-story studio building facing on Nineteenth Street, was opened last week by a reception to the governors of all the other clubs in the city. The old Tilden house forms the main part of the new club-house, the parlors now form a general reading room.

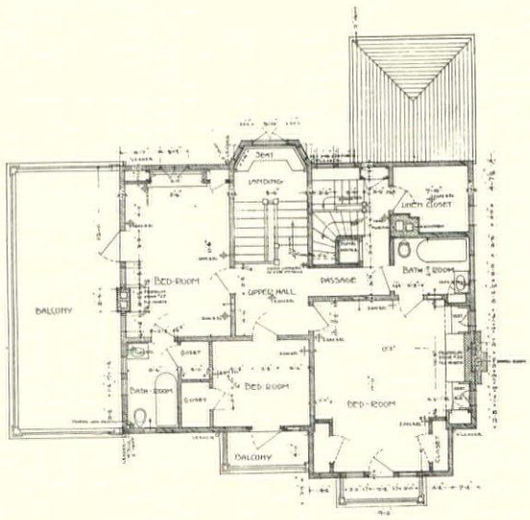
The Pelton house has been given over to the women members, who have a separate entrance as well as the entrance through the main club-house.

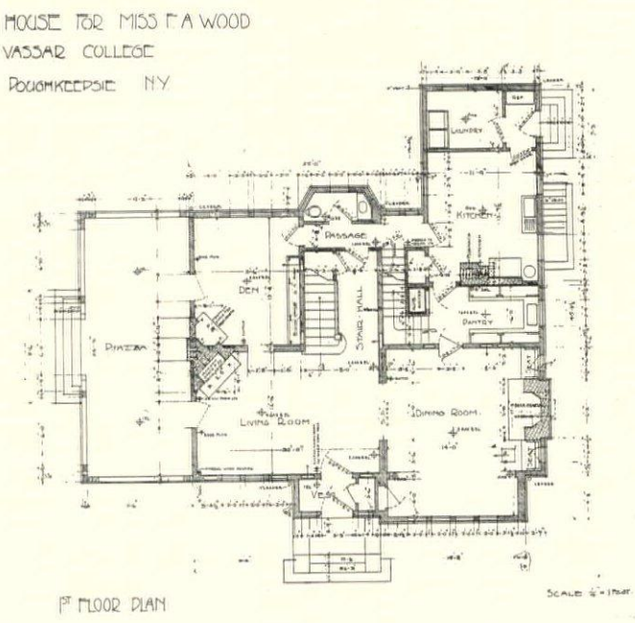
There are thirty studios in the Nineteenth Street building, all of which have been taken. Each studio has a suite of six rooms, there being the studio proper, a well-lighted room, with a large balcony, a workshop, and a retiring room, while above are three bedrooms to correspond.

Club members *only* can pass through the gallery or dining-room to the studio building on Nineteenth Street. On the first floor are the lounging, reception and reading rooms, also a portion of both the gallery and dining-rooms, which run through to Nineteenth Street in the studio building. The library occupies the entire frontage of the second story; the clerks' room and governors' rooms are in the rear. On the second floor of the studio building are two private dining-rooms, which can be thrown into one. The two upper stories of the club-house contain bedrooms, studios, etc.

HOUSES OF DR. W. B. HILL AND MISS F. A. WOOD, VASSAR COLLEGE, POUGHKEEPSIE, N. Y. MESSRS. PITCHER & TACHAU, ARCHITECTS, NEW YORK, N. Y.







THE SULLIVAN MEMORIAL FOUNTAIN, VAN CORTLANDT PARK, NEW YORK, N. Y. MR. F. E. WALLIS, ARCHITECT. MR. J. S. HARTLEY, SCULPTOR, NEW YORK, N. Y.

HOUSE OF H. L. PLATT, ESQ., CLINTON STREET AND WILLOUGHBY AVENUE, BROOKLYN, N. Y. MR. JAMES BRITE, ARCHITECT, NEW YORK, N. Y.

Additional Illustrations in the International Edition.

THE MONTALBAANS TOWER, AMSTERDAM, HOLLAND.

Another view of this very picturesque subject taken from the reverse direction may be found in our issue for February 27, 1886.

THE WEIGH-HOUSE, ALKMAAR, HOLLAND.

THE AMSTERDAM GATEWAY, HAARLEM, HOLLAND.

THE TOWN-HALL, LEYDEN, HOLLAND.

NOTES AND CLIPPINGS

LES PALMES ACADÉMIQUES.—Several letters have reached me from readers asking for information regarding the so-called Palmes Académiques bestowed by the French government in recognition of eminent services to the cause of art and literature. The history of France's Legion of Honor, as well as the insignia, is familiar to most Americans, but the other orders of knighthood of France are less known in this country. It may, therefore, be of interest to state that the Order of the Palmes Académiques was created by Emperor Napoleon nearly one hundred years ago, that is to say, in 1808, and consists of two classes. In the lower one the insignia is formed of two silver palm leaves, united at top and bottom into the shape of an oval wreath and suspended by a violet ribbon. In the higher class the palm leaves are of gold, and there is a rosette to the violet ribbon. A reproduction of this particular insignia will be found on the title-page of *"Gray Mist,"* a novel recently issued by the Harpers from the pen of the author of *"The Martyrdom of an Empress,"* who received the higher class of this distinction last summer, in recognition of the portrayals of Breton life in her books. The members of the higher class are known as "Officiers de l'Ordre de l'Instruction Publique," while the knights of the second class are styled "Officiers de l'Académie." The statutes of the order were amended by Napoleon III. in 1866 and again by the republic in 1886. It is granted by the Chief of the State on the nomination of the Minister of Public Instruction, and in the cases of Frenchmen five years' possession of the silver palms is requisite before there can be any promotion to the higher grade. While the silver palm leaves have been bestowed on a number of French women, particularly upon those who have devoted their entire existence to the direction of great philanthropic establishments and educational institutions of the state, the gold palm leaves are rarely awarded to the fair sex, and the authoress above mentioned is the only feminine recipient in this country of this distinction.—*Marquise de Fontenoy, in New York Tribune.*

ANNUAL OUTPUT OF SAND AND GRAVEL.—According to a bulletin issued by the United States Geological Survey, the total production of sand and gravel in 1905 was 23,174,967 short tons, valued at $11,199,645, an average value per ton of 48 cents, although the value varied from 6 to 8 cents to $6 a ton, according to the use to which the sand was put.—*Exchange.*

CORINTH CANAL FOR SALE.—Greek papers announce that the Corinthian Canal, which cost millions of dollars, would be sold at auction on November 14 on a foreclosure of a debt for $193,000.—*New York Evening Post.*

MAGELSEN'S MODELING CLAY.—The Italian Government is trying to find a way of suitably rewarding the Norwegian sculptor, Christen Dan Magelsen, for the discovery of the material used by the Greeks in modeling. Italian experts agree with G. Körte, Director of the German Archæological Institute in Rome, and the Director of the Greco-Roman Antiquity section of the British Museum, that Magelsen has found a clay which presents great advantages over the material now in use; and enthusiastic prophecies are being made as to the progress in sculpture as well as in ceramics which the new clay and its use will bring about when it gets into the market. Director Körte specifies two of its advantages: it facilitates the production of hollowed objects of any form and size, and it makes it possible to use iron supports without running any risks when the iron is heated, or contracts again. Björnstjerne Björnson writes enthusiastically about Magelsen in the Christiania *Verdens Gang*. This man, he says, who has discovered a secret lost for two thousand years, was originally a mariner, and it was not till after he had reached ripe manhood that he took up sculpture, although it had been his dream since childhood. He labored under great disadvantages. He was poor, had a large family to support, and was of unsocial habits. Yet, though he was an adept in neither physics nor chemistry, he learned to experiment with his material till he got what he wanted. Björnson hints at other important discoveries made by Magelsen, concerning which he does not, however, feel at liberty to speak.—*N. Y. Evening Post.*

SORDID ART COLLECTING.—Art collecting, as the millionaire understands it, is not a gratification of his taste or a satisfaction of his æsthetic instincts, but merely a device for money-getting. He buys for a rise, and he holds his stock simply and solely in the hope that he will eventually get more than he paid for it. What a sordid game has the patronage of art become!—*The Studio.*

A NEW HOBBY.—The ingenuity of collectors in the discovery of new fields having been exhausted, there is still open to them that of collecting the finest specimens of forged or spurious works of art, and this is capable of becoming a hobby scarcely less interesting or admirable than the pursuit of the genuine article.—*The Art Journal.*

S. MARK'S CAMPANILE.—"It is curious to come back to Venice after a prolonged absence," says a writer in the *London Globe*, "and find everything connected with the rebuilding of the Campanile in exactly the same condition as when I left. Confusion worse confounded still reigns supreme. Just as the falling of the Campanile led to the discovery of the instability of other buildings, so the stir made some months back led to the discovery of the possible instability of that portion of the brickwork of the body of the Campanile—about 25 feet in height—that had been already built. The time of delay between when the work was stopped, and the coming to a decision regarding the steps (which, however, has not even yet been come to), was enough for a suspicious efflorescence of sulphate to appear on the bricks of the new building, as well as on those in reserve. On breaking some of them it was found that this chemical change was going on through the whole brick. It now appears that all the careful studies made by Commendatore Boni, of Rome, on all the various clays for brickmaking, and on hundreds of specimens of bricks that he had had sent him, had been entirely disregarded. The present architects in charge—there being five of them—each had their own special brickmakers, and as is usually the case when there are too many interests at work, they seem to have chosen about the worst material. Moreover, some of them seem to have been to Poplar, for whereas the brickmaker recommended by Commendatore Boni had offered to supply the bricks (of the old Roman size, one foot square) for 80 francs per 1,000, the man chosen by the five wise men makes them pay 105 francs! The æsthetic blunder of the five steps at the foot of the tower caused the municipality, instigated thereto by members of the Government, to appoint a commission of seven to inquire into the work of the five—and now this commission of seven is requesting the appointment of a commission of three to examine the brickwork! And thus it goes on merrily. The five architects get about 5,000 or 6,000 francs a year, the various commissioners all get forty or fifty francs a day and all expenses (this being a high rate of pay in Italy), and so no one is in a very great hurry to decide.

"The local papers—I should rather say the popular local ones—are beginning to say it is high time for all this squabbling and jobbery to cease. They ask that the twenty-five feet done be pulled down at once, and that good old Marco Torres, the fine old master builder, should be left to build it up with good, honest work, and good honest material such as he has put into everything all his life. There is something sadly ludicrous in all these learned scientific and artistic men laying their heads together solemnly to do nothing."

Vol. XC. The American Architect and Building News. SATURDAY, NOVEMBER 24, 1906. No. 1613.

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SOCIETIES, PERSONAL MENTION, ETC. iv

THE building situation in Brooklyn, N. Y., has become acute, and the Superintendent of Buildings has made up his mind that he is not vested with purely ornamental functions, but that the public really expects him to give it protection by seeing that the building-laws, such as they are, are really complied with. Accordingly, he issued orders last week compelling the discontinuance of building operations on some two hundred and fifty buildings in various parts of the city, but most of them in the Brownsville district. This salutary action was taken because the condition of things at these buildings was found, during a personal examination made by himself and the President of the Borough, to be "shocking," and it shows clearly how reasonable was the demand he recently presented to the Board of Aldermen for an increase in his force of inspectors. But, as it is not supposable that the speculating builders of Brooklyn have all of a sudden been seized with a passion for running up "shocking" buildings, the public has good reason for looking with dread and suspicion on the buildings finished and sold earlier in this busy building year by the same unscrupulous men.

SEEING that, next to the water-supply, each individual has a greater personal interest in the building-laws than in any other controlling element that enters into the life of a modern community, since each individual is either tenant or owner of a building—a bed-ridden man having no concern with the condition of the streets, which rank next in importance—it is strange how little pains the ordinary citizen takes to ascertain whether the building-laws in his community are properly effective, and whether they are efficiently enforced by those public officials he employs to enforce them. It is not to be expected that the ordinary citizen should have a technical knowledge that would enable him to discriminate between good and bad laws, or should be so imbued with the national aptitude for mechanics of every sort as to be able to determine whether the work being done on the jobs he passes daily is properly done or not; but everyone knows that there are in all large communities men upon whose judgment and training he can rely, and that when such men as these unite in approving or condemning a law or ordinance they should have the moral support of the whole community. It is not so much the duty of the educated architects and engineers and trained and experienced builders in a community to interest themselves in procuring the enactment of proper building-laws as it is the duty of the public itself to compel these men to give it the protection which they alone are competent to provide.

THE personal interest that each individual has in a good building-law properly enforced really is vital and indisputable, and if this fact could only be driven home there would be an end to the public apathy which everywhere marks the attempts made by the more enlightened fraction of a community to displace antiquated, complex and outworn laws with those better suited to the needs of the day and the improved methods and greater variety of materials used in modern building operations. Yet the powers of evil, always sleepless, are inevitably found at such junctures conspiring to defeat desirable reforms, and we have speculating builders, real-estate sharks and landlords of an equally unsavory reputation combining actively to prevent real revisions of the building laws. With architects, who generally are the most active agitators for revision and reform, the matter is largely academic and impersonal, while with the three classes we cite it is an intensely personal matter, since it involves the almighty dollar, which, with them, holds the place of chief importance, and in its defense they are willing to spend time and other dollars that the reformers do not have at command. Still, as it can be shown by the records that the jerry-builders, speculators and shylock landlords will evade any law, even those they frame themselves, if they can save a dollar, it should be obvious to the public that there is a certain advantage in forcing them to undercut as good laws as can be formulated rather than laws as formless as those they profess themselves to be willing to observe. It is really the public's fault if the building-laws are not good, not the fault of reputable architects and builders.

IT is welcome news that the Italian Government has decided to allow, and even to join in the carrying out of Professor Waldstein's attempt to excavate Herculaneum—a truly herculean task, one requiring infinite skill and patience, vast resources and an indefinite amount of time; really a world's task in magnitude, and certainly one because of the universal value of the result, however imperfectly achieved. It was, therefore, quite excusable that Professor Waldstein should have attempted to procure a world-wide backing for his enterprise, forgetful of the fact that Italians had an *amour propre* that was likely to be offended by the offer of strangers to do a work which they rightly felt was peculiarly their own, and which they have always intended to undertake—some day. Patience and diplomatic persuasiveness have at length

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removed the obstacles, and it is now understood that the Italian Government will itself undertake the excavations, and, while declining to allow other governments to take part officially in the undertaking, will yet gratefully accept and utilize all moneys that may be contributed by private individuals and societies, of whatever nationality, desirous of helping along the most interesting archæological exploration ever undertaken. There never was any real doubt but that all "finds" would remain in the hands of the Italian Government, but all misgivings on this head are removed by the proposed arrangement.

THE attempt made at the last session of the Massachusetts legislature to pass a height-limit law that should have application to all cities and towns in the Commonwealth save Boston, which was already provided with such a law, did not meet with success, inasmuch as it encountered a more effective opposition than was expected; but the agitation of the matter did good, and the measure will probably be brought forward again this winter. This is all the more likely, since an attempt recently made in Springfield to erect a building one hundred and twenty-three feet high has just met with active opposition, and the citizens of that town now wish to fix a maximum height-limit of one hundred feet for the business and eighty feet for the residential sections of the town, further limiting heights to one and one-half times the width of the street upon which the building fronts. At the same time the validity of Boston's height-limit law is being tested in a suit before the full bench of the Supreme Court, the plaintiff wishing to erect, at the corner of Arlington and Marlborough Streets, a much higher building than is allowable under the eighty-foot limitation that has application in that district, and contending that the height-limit law is unconstitutional since it deprives him of property without due process of law and without compensation, as is assured to him by the constitution of the Commonwealth.

PERFECT or rather unlimited freedom of contract is a right that cannot be safely conceded to the most law-abiding of communities, but it is seems to us that, as interpreted by its attorney-general recently, the statute laws of Massachusetts quite needlessly interfere with the freedom of making contracts that obviously tend to promote the safety and welfare of the private citizen and of the public at large. Attorney-General Malone, at the request of the State Insurance Commissioners, has furnished an opinion that a practice quite generally adopted by insurance companies operating in Massachusetts actually contravenes the State law, and that contracts made in conformity with this habit are illegal and cannot be enforced. Broadly speaking, the Massachusetts law confines an insurance company to accepting risks of a single variety, be it plate-glass, burglar, fire or marine. With the exception of the one or two companies that make a specialty of insurance against boiler-explosions, there has been no possibility of getting anywhere in Massachusetts lawful insurance against loss by other forms of explosion caused by, say, illuminating-gas, soda-fountains, carbide of calcium, gasoline vapor, gunpowder, and so on, which cause disaster with considerable frequency. It has been more or less the practice of fire underwriters, in view of these circumstances, to add, at request, a special clause to their policies which, in return for an added premium of ten per cent., covers loss where fire follows an explosion however caused; but even in this case the victim could recover only for actual fire damage, and not at all for that caused by the explosion. This practice, which is now said not to have the sanction of law, may not be absolutely abandoned, but may be, by the authorities, allowed to subsist as a species of "gentlemen's agreement," in spite of the closer scrutiny that, everywhere, will be kept upon the proper handling and distribution of insurance income and surplus.

IT may be well to remind our readers that one of the engineering experiment-stations, we do not recall whether it was the one in Boston or that in Chicago, has conducted a series of experiments that tend to prove that oil, or at least certain oils, have a disintegrating effect on concrete. It will be well, then, for those who propose to introduce reinforced-concrete floors in mill buildings or machine-shops, where oil is likely to reach the floor from time to time in appreciable quantities, to bear this peculiarity in mind, and guard against the danger by giving the floors some really imperious upper surfacing. In view, also, of the too-frequent mishaps that attend attempts to build with reinforced concrete, mishaps whose causation is little understood, it may be worth while to suggest that, of many possible contributing causes, there may have been here and there a case where the presence of oil has, in some small degree, helped to cause or facilitate the disaster. Of course, the disintegrating effect, mentioned above, which attends long-continued soaking, can have no place in producing the accidents that occur during the process of construction, but though it is not usual to paint or oil the small rods or the webs of expanded-metal used for reinforcing, some practitioners may think it necessary to give this metalwork the same protective treatment that they give, as a matter of course, to the larger members, forgetting that a film of oil or too fresh paint will stand in the way of the effecting of the perfect bond between the cement and the metal which is the very essence of the life and usefulness of reinforced concrete; in the same way the unripe or green condition of the protective coating on the large metallic members is to be considered as a source of possible weakness.

IF a special cable dispatch to the New York *Sun* may be accepted as trustworthy, it would seem as if we were not justified in classing the Peace Palace competition amongst the successes, because of the recent decision to entrust the execution of his modified design to M. Cordonnier. It is now asserted that the Dutch competitors have united in opposition and have succeeded in securing the issue of a writ of injunction, on the ground that the jurors violated the rules under which the competition was organized. Although the nature of the alleged violation is not specified, it is plain that expert-advisers have expended their time and labor in behalf of very thankless fellow-architects in this case, as in so many others.

BUILDING IN EARTHQUAKE COUNTRIES.—III.

SO each of the constructive elements of a building is, according to its form and its position in the building, submitted to special modes of destruction, and the final result of these partial disintegrations is the destruction of the whole building. Now, it is found that without essentially modifying the ordinary forms of these elementary parts, which of course would be quite out of the question, we can derive from their mutual arrangement better dispositions that are capable of assuring a relative security by making them conform to the rules which experience has deduced for each of them.

Whether because of the nature of the materials most available in the country, or because of habits acquired rather by instinct than reason and dearly paid for with experience, we can say that each earthquake-affected country has its own peculiar methods of constructing its ordinary buildings, and also we must acknowledge that climate has something to do with the matter. These practices are more or less effective in resisting earthquake shock and a rapid review of them should enable one to deduce from them the general principles that must be applied to the construction of the gigantic buildings called for by the intensity of modern life, which in the great industrial and commercial centers leave to architects only the most restricted of space, while their operations are hampered by countless complications, even in those places where they have to give no thought to earthquake dangers. In a thorough treatise on the subject I should have to consider all kinds of buildings erected in unstable countries, but here I have only to study, and very briefly, those systems that are endowed with a certain immunity in order to reach at length a true conception of the general principles which must guide one who undertakes to build in a dangerous region. It may be stated that Japanese temples are quite immune to earthquake shock. In fact, most of them have for centuries resisted the most violent shocks. They are framed and built of wood and incredible amounts of lumber have been consumed in their construction. But all their parts are so tied and framed together that at length the building becomes a really indeformable whole. More than this, the most lofty and slenderest of the pagodas stand securely, and we do not find them warping and twisting or giving way except through decay, as was the case November 11, 1853, with the pagoda at Asakusa. The source of this wonderful security unquestionably lies in the perfect system of tying, and so we can feel certain that if the Eiffel Tower should be transported to those regions it, too, would successfully withstand all shocks.

Writers have often declared that the common houses of the Japanese enjoyed the same immunity and that their structure has been designed with this express object in view. But there is nothing in this; the lack of beasts of burden, there replaced with human beings, is the real reason for neglecting to build with stone. The common house is composed essentially of a light framework, rather poorly put together and almost wholly lacking in ties. In truth, except when the roof is too heavy, the house in time of shock often slips off its stone supports, and the result of the fall is merely a slight deformation that is easily righted, thanks entirely to the elasticity of the structure, which has often been likened to that of a wicker basket. Moreover, in time of great earthquakes, in spite of this legendary immunity, there have been the most appalling disasters, as is shown by the chronicles of the Japanese Empire during the last twenty centuries.

Almost at the other end of the world in the volcanic island of Santorin, in the Grecian Archipelago, we find monolithic buildings forming a single vaulted block and made out of a species of concrete called "*aspe*." Few openings pierce the walls of these overturned boxes, cool in summer, warm in winter, and quite indestructible by earthquake shock, as was well proved by their resistance to that of October 12, 1856, scarcely a crack was produced by the most violent vibration, and such as were made closed up of themselves under the weight of the structure, so that it was difficult to discern them the next morning. This rather comfortless species of building is hardly to be recommended, but it is highly instructive, since it exhibits the security of an indeformable box.

The seismic catastrophies of Spanish-America are so well known by every one that it may seem strange that we should turn thither in our search for a type of building that can resist earthquakes. There is such a type there, but unfortunately it is generally carried out so inefficiently that its real resisting qualities remain quite illusory. The creole house is really a derivation from the Roman house of Classic time wherein wood has been substituted for stone.

It consists of horizontal and vertical framing of the usual kind, the roof timbers projecting far beyond the face of the wall and resting upon the tops of wooden posts that are supported on stone pedestals, so that a veranda is formed in front of the rooms, each of which opens upon it independently, without having intercommunication with any other room. The framing, very defective, is carried out in a happy-go-lucky way, the partition-walls often not being tied to one another, while ceilings rarely form a bond and floors almost never. Moreover, the rafters are not tied to the wall-plate, and the veranda-posts are merely framed into them with tenon and mortise. Such a combination is quite ready to draw apart and fall under the attack of the slightest of shocks; but when all the defects, adopted with such fatalism, are carefully corrected the creole house forms an elastic whole that is almost indeformable, all the more so since its roof forms an integral part of it. It should, then, be held to be an excellent type, and such experience demonstrates it to be.

A framework does not by itself constitute a wall, there must be filling, and here arises the difficulty. Customarily adobe is used, large sun-dried bricks that offer sufficient resistance when they are mixed with chopped straw. As builders are often content simply to pile these bricks one on top of the other with unbroken joints running from the foot to the top of the wall, and as the roof often rests with its full weight on this fragile material, it is easy to comprehend why Spanish-American cities enjoy such somber reputations in the annals of seismology. But their walls are not always built in this dangerous fashion; we now and then come upon houses where the walls are formed with a double row of posts, to each face of which has been fastened a lining of reeds or canes which divide the wall, sectionally, into three separate compartments, of which two, the outer and the inner, are then filled with puddled clay or mud. In this way there is provided a double wall with a space for ventilation between, the obvious utility of which is rather offset by the fact that this intermediate space affords harborage for all sorts of vermin. Buildings constructed after this fashion have an almost perfect elasticity which enables them to withstand the most violent shocks. Many old churches fashioned in this way have endured countless earthquakes. This type of creole building, if carefully executed, is practically safe in an earthquake region. To be sure, this filling of mud or clay after it has become dry is easily pulverized by the frequent strokes that occur along the Pacific seaboard and escapes as a fine dust between the joints of the reeds with every movement. In buildings of a better class the reed linings are replaced with boarding, which adds appreciably to the solidity of the structure. There could also be substituted for the clay filling little fagots of tightly twisted twigs dipped several times in hot lime and rammed into the interspaces, as is done in the Caucasus. Walls built in this way have the advantage of being nearly incombustible. Thus, the experience of ages shows that our overturned box, or, better, a box completely framed and pierced with the necessary openings, through its elasticity and the synchronism of the movements of its component parts, enjoys perfect immunity against earthquake shocks, but only on condition that the workmanship shall be neither defective nor careless. It is along this way that safety always has been sought and that municipal ordinances have been established—established only to be left unobserved.

This system of the *maison-baraque*, the *casa baraccata* of the Italians, was made obligatory in Portugal after the terrible disaster of November 1, 1755. Naturally its very effectiveness brought it into desuetude, and, moreover, they complicated matters by lining the walls with ceramic tiles, very artistic it is true, but whose weight and imperfect bond with the walls proper introduced a fresh danger.

This class of structures was very carefully studied by the Spanish engineer corps after the earthquake at Manila on June 3, 1863, and its adoption was more strongly insisted on after the shocks occurring between the 17th and 20th of July, 1880.

After the highly practical fashion of the extreme East, the Tokio Earthquake Committee have perfected these barrack-houses, thus continuing the work that has put Japanese savants in the first rank of modern seismologists. They recommend the use of bricks of a complicated form, dovetailing one into the

[1] A paper read at the Thirty-fourth Congress of the Société Centrale des Architectes Français by M. le Commandant Montessus de Ballore, graduate of the Ecole Polytechnique.

other, but this, while certainly introducing a certain amelioration, does not, so far as walls go, solve the problem of the employment of a material whose movement does not harmonize with that of the framework.

Taking as his point of departure the fact that well-framed roofs often fall uninjured onto the débris of the building they once covered, a Japanese architect, Mr. Inouye, has devised a sort of English cottage, of one story, that has interesting features: the roof-timbers, very steeply pitched, are prolonged until they strike the ground, then to disguise this curious treatment vertical walls are built of wood both indoors and out, so that the doors and windows, quite as in the Middle Ages, are cut through walls of excessive thickness, only here the wall is but an empty space traversed diagonally by the roof principals.

After the severe shock of December 25, 1885, in Andalusia and after that of January 30, 1902, at Chemakha, in Caucasus, these were established types of the ordinary Spanish house, which is little open to criticism, and also of a Russian "isba," much better conceived, the condition in each case being that as little as possible should be done in the way of changing the national aspect of the villages, so as not to offend local prejudices: many similar cases might be cited. It might be added here that the greater part of the portable houses satisfactorily meet the conditions of this problem.

In this way it became reasonable to think of using a metallic framework and, truly, here must lie the solution sought by the great industrial centers, where the constantly crowding population makes it necessary to seek in height the accommodation that is denied by restrictions of site; and it should be remembered that all the buildings I have been briefly considering are intended for the use of but a single family. The English have used metal-framed buildings for barracks in India, though earthquakes had nothing to do in determining their adoption. On the other hand at Casamicciola, on the Island of Ischia, the municipality deliberately adopted this style of construction, after the earthquake of July 28, 1883. Unfortunately the proper way of filling in the walls is still undetermined; but it is certain that the common masonry or brickwork so often used for the purpose in exhibition-buildings and railway-stations is to be eschewed, as well as sub-basements built with cut stone. It is, again, the lack of synchronism in the movement of the different materials that makes this recommendation necessary.

It will occur to every one that reinforced-concrete is the very material that satisfies the conditions. In getting down to the root of the matter, it will be recognized at once that here the fundamental idea dates back some thirty years, when a French engineer, Lescasse, expressed himself thus: "The ideal, in a country troubled with earthquakes, would be found in a masonry construction whereof the materials and the cement that binds them together have become so adherent that one may properly consider the entire structure as being a monolith. . . . Finally it is needful to make a building rigid, heavier at the base than at the top. . . . In using the words 'monolith' and 'rigid,' I do not mean that the structure should not have the elasticity that all masonry exhibits to a greater or less degree, for this elasticity is unquestionably necessary, especially for resisting those sudden and jerky shocks that one often feels during an earthquake." Starting with this idea, Lescasse conceives that the ideal wall might be divided into vertical slices or piers by, for instance, windows at each story, so that each pier forms for its own account a single, solid and indestructible body, and that all of these piers shall then be tied together. In this way he deduces a system of vertical and horizontal ties, of iron or steel, buried in masonry and tied together in the three orthogonal directions of the building, height, length and breadth, the vertical ties helping to form the piers while the horizontal ties unite these together in an indeformable way. Lescasse foresaw the destructive effect due to differences of expansion at varying temperatures and provided a system of wooden keys that were inserted at the joints. It is doubtful whether this device would have proved effective, while it is certain that the lack of synchronism between the masonry and the ironwork would have brought about the disintegration of the wall.

But if we multiply the metal rods Lescasse suggested until his system is transformed into a reinforced-concrete system, it would seem that all these disadvantages must disapear, for then the union of the two materials forms a coherent mass, thanks to the elasticity of the metal which has taken on almost a preponderating influence. Herein lies the future success of building in earthquake countries, and architects ought not to be seriously troubled to devise really artistic forms, by the adjunction of accessory elements, so combined with the essentially plastic material, as reinforced-concrete really is, that the solidity and stability of the whole shall not be compromised.

It does not seem to me that any sound objection can be brought against the use of reinforced-concrete, thus transformed into monolithic and elastic boxes; but I am less satisfied as to its applicability to those immense edifices that the North Americans take pleasure in erecting. We are as yet hardly satisfactorily informed as to the manner in which the great hotels and sky-scrapers behaved at San Francisco last April. Apparently they propose to use the "steel-cage" construction very freely in rebuilding; now this term may mean several things: either the metallic framework is to be buried in the mass of the wall, no matter what the material of the wall may be, and in this case the peril will remain quite as grave as in those types we studied at Casamicciola; or it may mean that the framework is to be enclosed by the walls, in which case safety would be indicated. Unfortunately this second interpretation seems rather unlikely to be the one actually followed.

Apparently the San Francisco authorities are not concerning themselves with the orientation of the great arteries of trade, and yet the topography of the city urgently requires that this matter should have careful consideration. If it is neglected, a heavy and grievous fault will be committed which, we may be certain, will cost the city dearly hereafter, sooner or later. The problem has two chief factors, and it will not do to consider only one of them.

Architects and builders who have to carry on their work in earthquake countries not only have to understand thoroughly the strict rules of safe building under the special conditions thereto attaching, but a serious duty is also imposed upon them, that of being able to demonstrate to their clients the necessity that exists for a strict compliance with these methods. Governments and municipalities assume a great responsibility, as towards future generations, if such rules are not formulated and compliance with them carefully exacted. The first of these duties has often been performed, but the second never; the consequence being that the actual result has been *nil.* On this point it may be instructive to say a few words.

Passing over the legend which has currency in Central America according to which the Spaniards prohibited anyone, under pain of death, to build a second story on the top of the standard single-story building, it is interesting to note that the oldest known laws were established on French territory, the ordinances, namely, promulgated by the Dey Ali after the earthquake of February 16, 1716, at Blidah, in Algeria. Although the penalties were severe, this did not keep the laws from falling into general neglect, as did those framed by the Marquis de Pombal for Lisbon after the catastrophe of 1755. In Italy the same fate attended the pontifical statutes that followed the earthquake at Norcia, December 22, 1859, and the one at Ischia in 1884 produced laws that no one attempted to obey. Perhaps it was the foreknowledge of negligence gained from these earlier experiences that led the authorities in 1887, after the earthquake of February 23, to decide that it wasn't worth while to take the trouble to publish the laws they had prepared for Liguria. Perhaps they shrunk before the clamor of wealthy speculators who would have found it expensive to ameliorate the methods they had habitually followed in building the costly villas intended for cosmopolitan globe-trotters. No one can be surprised at the small success that followed the enactment of new laws in Manila in 1863 and again promulgated in 1880. There was nevertheless an admirable chance, through the establishment of new functionaries, the inspectors of buildings, who were to look after the enforcement of the laws. But if the general government of the Philippines neglected the opportunity, it certainly was not through motives of economy; the sheer inertia of routine methods was responsible.

So, up to the present day, no government, no municipality has had the force and the will to enforce tutelary rules upon the populations of countries affected by earthquake. When a new earthquake comes along, as come it inevitably will, things will follow their accustomed course once more.

My only hope is to have contributed, in however little a degree, to bring about a realization of the greatest importance, namely that the public authorities in the countries concerned should with all their might and influence intervene between their fellow-citizens and a danger that exists solely because of a heedlessness centuries old.

THE DEVELOPMENT OF IRON AND STEEL ROOFS IN ENGLAND.—I.

IRON and roof construction on a large scale may be said to have commenced with the Exhibition building of 1851, the chief members of which were afterward incorporated in the Crystal Palace. As everybody knows, the original idea was due to Sir Joseph Paxton, but it is not so generally known that its realization depended in great measure upon the assistance given by Sir Charles Fox on behalf of the contractors, Messrs. Fox & Henderson, of Birmingham.

The main arched ribs of the Exhibition building, like those of the Crystal Palace roof, were intended to act as girders without exerting lateral thrust, although provision for arch action was afterward made by the addition of bracing between the supporting columns, thus enabling these members to act as abutments. Further progress was evidenced in the construction of the Crystal Palace by the skilful combination of cast-iron and wrought-iron in the roof of that building. The details of both designs were worked out by Sir Charles Fox, most of the working drawings being made by that gifted designer, Mr. R. M. Ordish, then engaged in the office of Messrs. Fox & Henderson.

The Crystal Palace roof may be looked upon as the prototype of some other arched roofs to which we direct attention hereafter, and its self-contained character may have suggested to Messrs. Fox & Henderson, with whom Mr. Ordish was still associated, the suitability of the arched trusses forming the principals of the roof erected in 1851-4 over the New Street station, Birmingham.

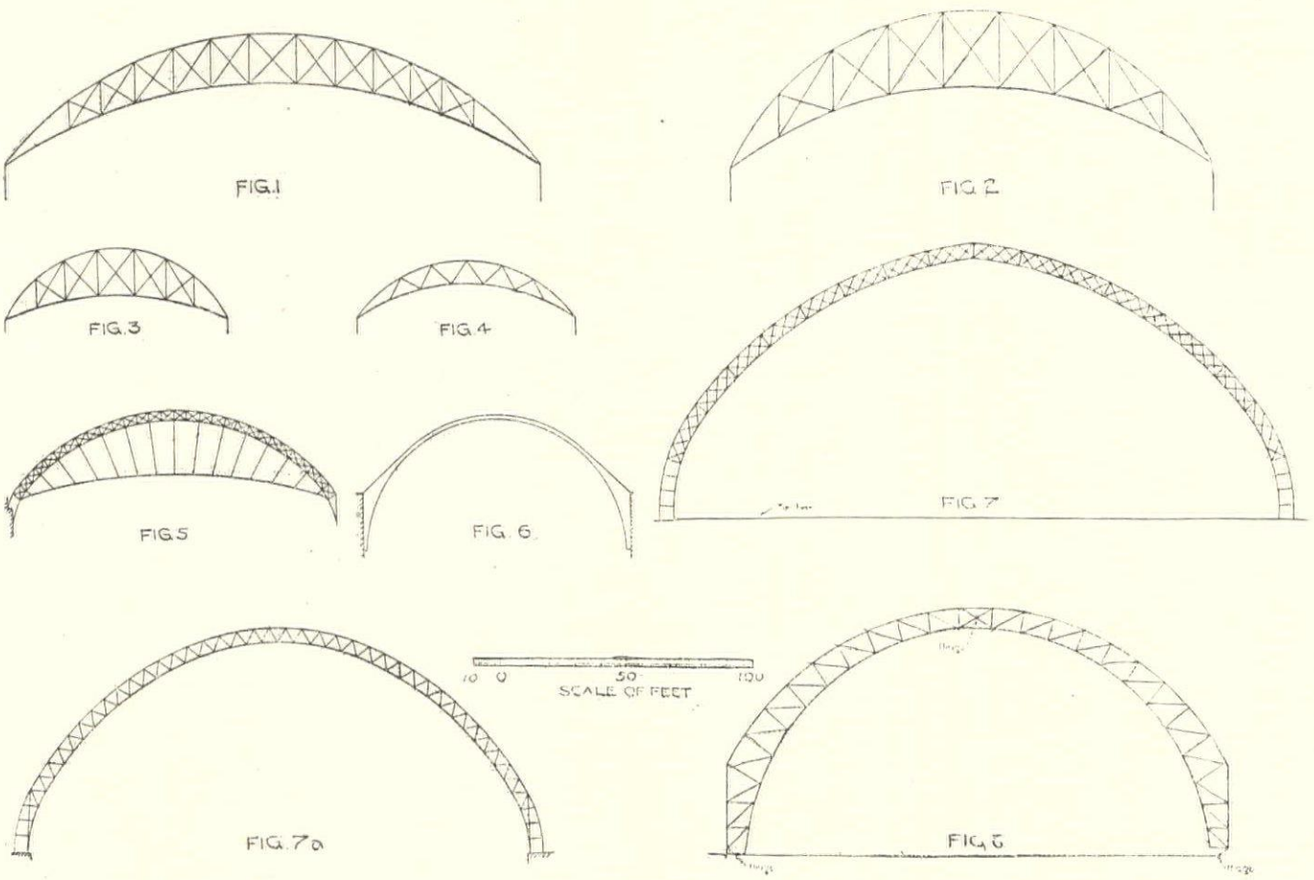
Fig. 1 is a diagrammatic representation of this roof, which has a clear span of 212 ft., and is a magnificent specimen of early engineering, still in serviceable condition.

In consequence of the accident to the Charing Cross Station roof, some question was raised as to the safety of the roof at New Street, more particularly as this was admittedly the model of the unfortunate structure in London. Therefore, it is worthy of record that the London and Northwestern Railway Company have reliable evidence that at the time its Birmingham roof was erected each of the tie-bars was tested far beyond the stress it bears to-day, that when these bars were last examined they were shown to be absolutely sound, and that the ironwork of the roof generally is in an excellent state of preservation. We have the best authority for stating that when the next periodical cleaning and painting of the ironwork takes place the tie-bars will again be thoroughly examined, and that no apprehension is entertained by the company as to the stability of the roof.

The roof of Fenchurch-street station, designed by Mr. Berkeley, and built about 1851, was another historic structure until its replacement about four years ago by a new roof. The original design was similar in respect of the arrangement of the bracing to that at Birmingham, and one praiseworthy feature which redounds to the credit of Mr. Berkeley was the adoption of duplicate tie-bars at a time when the necessity for such a safeguard was not generally recognized by structural engineers.

As stated in our article of December 23 last, the designs of the roofs for Charing Cross and Cannon-street stations were generally similar, but the details of the latter are superior in several respects. At Cannon Street the clear span of the roof is 190 ft. 4½ in., the rise of the rib at the center being 60 ft., and the rise of the tie-bar 30 ft., making the truss 30 ft. deep at the center. Each main truss consists of a segmental rib with a tie-bar and bracing as in Fig. 2. The main rib is a plate-girder, 21 in. deep by 14 in. wide, the tie-bar has a uniform diameter of 5 5-16 in. throughout, in nine lengths, the ends of each being swelled out to form eyes which are secured by bolts to coupling blocks, and the vertical struts, dividing the principal into nine panels, consists of two T-bars bolted back to back with a stiffening plate to each bar, and the diagonals are plain bars 6 in. wide by ½ in. thick, these members bolted and riveted to a plate projecting from the coupling blocks.

The east end of the truss is fixed, and the west end is provided with a rocking-saddle, beneath the bottom plate of which rollers are placed to provide for expansion and contraction, the object of the hinged foot being to insure that stress shall pass through the center of the group of rollers under all circumstances. Thus the connections of the tie-bar are not only more secure than were those of the former roof at Charing Cross, but by permitting more freedom of action they obviate the bending moments that are sure to be developed in the parts of a bar with rigid connections. Further, the arrangement of the expansion device at the



Diagrams of Roofs.

free end of the principal is in every way superior to the analogous arrangement at Charing Cross.

The wall construction of Cannon-street station is considerably thicker than at Charing Cross, to say nothing of the towers at the south end. Between the two towers is a gable screen consisting of two wrought-iron trusses of the same radius as that of the roof ribs and nearly horizontal at the bottom. These two trusses are spaced 11 ft. apart and connected so as to form one broad girder, which, being held down by wall bolts, constitutes a firm and effective bracing for the walls.

An undesirable feature presented by both the Cannon-street and the old Charing Cross roofs is that, as the ironwork is mounted upon exceedingly high walls, examination and maintenance are rendered unnecessarily difficult. Inspection, cleaning, painting, and renewals can only be conducted from scaffolds suspended from the roof principals, involving methods of work that are neither safe nor convenient. The risk of failure is distinctly accentuated by erecting ironwork in positions where it cannot be inspected easily and thoroughly, and the consequences of any partial failure are needlessly increased by the exaggerated form of a design that is good in itself, if carried out in accordance with all the precautions suggested by practical experience.

Among other early examples of roofs with segmental trusses one of the best known is that over the London Bridge terminus of the London, Brighton & South Coast Railway, comprising a center span of 88 ft., and two side spans of 87 ft. and 91 ft. respectively. The main features of the 88 ft. span are as follows: The system of bracing is represented in Fig. 3, the main rib being a curved plate-girder, the ends of which are bolted to columns. The tie-bar, of 2½ in. diameter throughout, is made in separate lengths joined by screwed coupling-boxes somewhat similar to those at Charing Cross. The struts of the bracing are tubular and the diagonal ties consist of flat bars, the bracing being connected with the screwed coupling-boxes, by means of a saddle-piece on top of each coupling-box, the strut fitting into a socket, and the ties connected by bolts to projecting lugs. The strut is provided with a bolt, which passes through the middle of the coupling-box and serves to hold the saddle in place.. This arrangement is certainly not one that would be adopted in the present day.

The old Blackfriars passenger station (London, Chatham & Dover Railway) possessed a roof of excellent design, which was removed when the station became converted into a goods depot. The principals of the main roof had a span 87 ft. 3 in., the rib being a curved plate-girder, and the tie-rod consisted of two parallel bars, having the uniform width of 5 in. and varying in thickness from 5-8 in. to 9-19 in. The bracing, of which Fig. 4 is a diagram, consisted of duplicate bars, the tie-bars and bracing being connected by a 2 in. diameter turned pin at the junction of the three members. This is a good method of construction, as the duplicate bars give the assurance of safety that is always to be desired in roof trusses of the kind.

Another important example is furnished by the roof of Lime-street station, Liverpool, designed by Sir John Fowler, and built by Messrs. Handyside & Co., in 1872-3. The main portion of the station, which was enlarged in 1875, has principals with an average span of 212 ft., the bracing being similar in arrangement to that in Fig. 4.

The main rib is a curved plate-girder, the ends of which are supported on columns. The main tie consists of a series of four 5½ in. by 15-16 in. flat bars, placed side by side, the ends of the separate lengths of the links being swelled out to form eyes, connected at each joint by a steel pin 4⅝ in. diameter. In every case the bars were forged solid without welds. Each member of the bracing consists of two angle bars spaced apart by cast-iron distance-pieces secured by bands of half-round iron. The diagonals of the bracing are connected by ¾-in. web plates, each of which has an eye at the bottom through which passes the steel pin connecting the different sections of the main tie. At the top the bracing is connected in a somewhat similar way, but the web plates are riveted to angle brackets attached to the main rib. This roof is a very fine example of practical and theoretical design which it would be difficult to improve upon in the present day. Apart from its other meritorious features, the roof is quite safe from any accident such as that which overtook the unfortunate structure at Charing Cross, for with four solid forged links in each length of the main tie, one or two bars in each length might break without involving failure of the principal affected.

A form of design somewhat resembling the Charing Cross roof in principle, although differing in points of detail, is typified by the roofs of Victoria station (London, Chatham & Dover Railway), the Central station, Liverpool, and Queen-street station, Glasgow. Fig. 5 illustrates the general idea embodied in these roofs. Each principal is really an arch with the ends connected by a main tie-bar looped up by radial ties.

The roof at Victoria comprises two arches of 127 ft. and 129 ft. span respectively, one end of each being supported by roller bearings on brick walls, and the other ends fixed to the top of a cast-iron column. The bracing of the arch itself comprises a double system of triangulation and perpendiculars between the upper and lower flanges, the principals being spaced 35 ft. apart, center to center. This roof was designed by Sir John Fowler, as also was that of the Central station, Liverpool, which has nine principals of 160 ft. span, spaced 55 ft. apart. The general construction is similar to that of the Victoria roof, but it should be noted that all the tie-bars and rods are of steel.

Queen-street station, Glasgow, is the most important example hitherto built of the tied arch construction now under consideration. The roof includes nine principals of 170 ft. span and spaced 41 ft. 6 in. apart.

In the three last-mentioned examples single tie-bars are relied upon to take the thrust of the principals, an arrangement which, in view of the wide spacing between the principals, cannot be regarded as satisfactory.

Let us now turn to an entirely different type of roof, in which the principal of the arch is applied in such a way as to obviate the use of tie-bars.

The earliest arched roof for a railway station was that at King's Cross, built in 1851, on a system entirely new in this country, the arched ribs consisting of a series of wooden planks held together with screws and trenails. The roof included two spans of 105 ft., the abutments of which were constituted by the station walls and buildings. In 1869 the ribs over the arrival platforms were replaced by wrought-iron arches of similar shape, and in 1887 the roof over the departure platforms was similarly replaced, owing in each case to the signs of decay which became evident in the timber. Fig. 6 is an elevation of the new rib, which is practically a reproduction of the design employed in the Great Northern station at Bradford.

Paddington was the first railway station to be spanned by wide and lofty iron arches. The roof was designed by Brunnel, and built by Messrs. Fox & Henderson, about 1856. It consists of three spans, the center one 102 ft. 6 in., and those on each side of 70 ft., 68 ft., respectively. This is one of the most elegant structures of the kind in existence, and the simple method of ornamentation in the web of the ribs is particularly worthy of commendation.

The next noteworthy type of iron roof design in railway practice is illustrated in St. Pancras station, St. Enoch's station, Glasgow, and the Central station, Manchester.

St. Pancras station, completed in 1867, was designed by Mr. W. H. Barlow, F.R.S., then chief engineer to the Midland Railway, the design of the ironwork having been intrusted entirely to Mr. R. M. Ordish, to whom Mr. Barlow publicly gave all the credit for the fine engineering work represented by the roof in question. The main requirements of the case were that an unimpeded width of 240 ft. should be provided between the walls of the building, that the roof should be without complicated bracing and easy of access, and that buttresses should not be built outside the station walls. The design prepared by Mr. Ordish admirably fulfilled these conditions, and resulted in a distinctly novel form of railway roof construction, which is diagrammatically represented in Fig. 7. Each latticed rib is carried down to a massive base plate placed upon masonry foundations below the floor level, the abutments being formed by 20 ft. of solid brickwork. The ends of all the ribs are connected by girders below the floor level of the station, although it is doubtful whether any tensile stress actually comes upon these members.

The roof of St. Enoch's station, Glasgow (see Fig. 7*a*), has a span of 198 ft., and is very similar in general design to St. Pancras, although the bracing of the main rib is not quite the same, and there are no ties connecting the ends of the arch ribs. The ends of these members are secured to base plates bolted down to masonry foundations, and with the object of counteracting the outward spring of the arches the base plates extend 20 ft. inward. This roof was designed by Mr. A. Galloway, and built by Messrs. A. Handysides & Co. in 1871.

The roof of the Central station, Manchester, on the same principle as that of St. Enoch's, has a span of 210 ft., and was built soon after the completion of the Glasgow roof.

The opinion is generally held that roofs of the St. Pancras type are unnecessarily extravagant in first cost, and have other disadvantages for which, however, railway managers of a past generation, and not the designers, must be blamed. As illustrating the change that has taken place with regard to this point, it is worthy of remark that in referring to the St. Pancras station, Sir Ernest Paget, the chairman of the Midland Railway Company, said that although the proprietors were proud of it as a triumph of engineering skill, it was an utter abomination as a railway station from an economical point of view, and was incapable of lateral extension.

It ought to be pointed out, however, that the St. Pancras type of roof has been reproduced in various important structures on the Continent and in the United States within recent years. Some of the more modern examples of this class embody the principle of the three-hinged arch, a method of treatment which has the advantage of defining wind and load pressures

The roofs of the new station of the Pennsylvania Railroad at Pittsburgh and the Jersey City terminus of the same line both represent the St. Pancras type of design. These stations are practically alike, except in respect of some minor details, and the dimensions are approximately the same, being about 555 ft. long by 260 ft. wide by 110 ft. high over all. Fig. 8 is a diagram showing the general design of the trusses, which are of the three-hinged type, spaced alternately 9 ft. and 40 ft. 6 in. apart, and braced together in pairs, the vertical ends of the ribs being braced on each side of the building by a continuous line of lattice girders. The ribs have the span of 255 ft. between the centers of the end hinges, a rise of 93 ft., and the clear height of 87 ft. above rail level. The hinge at the crown is in the center of a panel, where the diagonals are made extra heavy for the purpose of transmitting the stresses to the 5 in. center pin which engages jaw-plates locking the two sections together. At the foot of each half of the rib a double-webbed shoe is riveted, having a semi-cylindrical bearing and jaw-plates engaging the lower hinge-pin and locking it to the pedestal. This pin receives the end of the horizontal lower chord or tie which connects the two ends of the rib and takes the thrust of the arch. The lower chord crosses the station in a closed trough below ground level, and is formed of a 12 in. I-beam in 30 ft. lengths riveted up by means of double web and single flange cover-plates. This roof was built in 1902 from the designs of Mr. W. H. Brown, chief engineer to the Pennsylvania Railroad Company.

Another American roof of similar type is that of the Drill-hall, in the Maryland Armory, Baltimore, built in 1904. The roof covers an unobstructed floor area about 293 ft. long by 199 ft. wide, the space being spanned by ten three-hinged arch ribs, with a rise of 88 ft., the ends of which are joined below floor level by a tension member, consisting of two 8 in. channel bars for the purpose of resisting the outward thrust.

It is interesting to note that when the ribs of a roof, such as these examples, are adequately connected by horizontal chords, each rib really forms a series of bowstring girders of gigantic proportions, resting upon solid earth. Moreover, the public actually walk inside the girders instead of being many feet below them, as happens in buildings roofed over by trusses of the ordinary kind.—*The Builder.*

(*To be concluded.*)

PROBING THE PENNSYLVANIA CAPITOL SCANDAL.

THE Attorney General for Pennsylvania, Gen. H. S. Carson, has addressed to Mr. J. M. Huston, the architect of the new Capitol, the following questions designed to draw out an explanation as to how and why the latter adopted the singular method of demanding the submission of bids "per pound" and "per foot" for the famous "furnishings" that consumed thirteen millions of the State's funds:

The following items, selected from the schedule, will show the manner in which the special furniture, carpet, fittings, and decorations for the equipment of the new Capitol were to be priced:

Item 1.—Bookcases and wardrobe (mahogany); Series F; per lineal foot, maximum price, $37.

Item 7.—Leather-covered couch, 3 feet and 6 feet 6 inches (solid mahogany); Series F; maximum price, each, $100.

Item 22.—Designed furniture, fittings, and decorations of either woodwork, stone, marble, bronze, mosaic, glass, and upholstery; Series F; per foot, maximum price, $20.

Item 23.—Mural and art paintings; Series F; per foot, maximum price, $50.

Item 24.—Decorating and painting; Series F; per foot, maximum price, $3.

Item 28.—English-laid interlocking wood and rubber parquetry flooring; Series F; per foot, maximum price, $1.50.

Item 31.—Designed special-finished bronze-metal gas and electric fixtures; Series E-F; each, miximum price, $225.

Item 32.—Designed bronze-metal for gas and electric fixtures, hardware, and ornamental work; mercurial gold finish; hand tooled and rechased; Series E-F; pound, maximum price, $5.

Item 33.—Designed, special-finished white-metal gas and electrical fixtures; Series E-F; each, maximum price, $150.

Item 41.—Moravian tiles; Series F; per foot, maximum price, $3.

General Carson writes as follows:

"My Dear Sir:—As you were the architect of the Capitol, and prepared the specifications and the drawings upon which the advertising for bids in the matter of furnishing the Capitol were based, I now address to you the following questions:

"*First.*—How were these specifications prepared? Were they prepared by you? What knowledge had you, either theoretical or practical, of the methods of determining the proper basis upon which bids for furniture and fixtures for lighting should be invited?

"*Second.*—What knowledge had you of the 'per foot' adopted with regard to furniture, under schedule No. 22 and the 'per pound' rule adopted with regard to chandeliers, side brackets, standards, castings, electroliers, glass adornments, and other fixtures, furnishings or fittings, and adornments relating to the lighting of large building and official rooms, corridors, and galleries, passageways, and vaults, before the preparation of the schedules, the drawings and the specifications? If you had knowledge of the 'per foot' and 'per pound' rule in the above connections, from whom did you obtain such knowledge, and when did you acquire it?

"*Third.*—Had you ever known, in practice, the standards of 'per foot' in the measuring of furniture, and of 'per pound' in the weighing of chandeliers, and other matters detailed in the previous question, prior to your preparation of these schedules? If you answer that you had known them to be used before, please state where they were used, and where they are now in use. If you answer that you had no such knowledge, be good enough to state by whom you were informed that such standards could be properly adopted, and the reasons given for such adoption. Give the names of all the persons with whom you had conversations, and state time, place, and circumstances.

"*Fourth.*—If such standards of value were unknown to you, how did the thought occur to you to employ them? Who suggested them? With whom did you have conferences before the schedules were prepared? Did any of the actual bidders make such suggestions?

"*Fifth.*—Did John H. Sanderson make any such suggestion prior to the publication of invitations for bids? Were any such suggestions made by him before you prepared, or while you were preparing the schedules?

"*Sixth.*—Have you any knowledge of the names of the bidders whose bids were opened? If so, please state their names, and state whether or not you had, previous to such advertising, any conference or conversation whatever with any one of such bidders; and, if so, state whether or not such conversation affected your judgment in the shaping of the schedules, and whether or not you adopted such suggestions, in whole or in part, and introduced them into the schedules?

"*Seventh.*—Why was there a distinction made between item No. 2 and item No. 22 of the special schedule? What, in your judgment, is that difference? What effect would it have upon the price? If it had no effect, why was it adopted? If it had the effect of increasing the price, why was it adopted? Who would benefit by the increase, if there was an increase?

"*Eighth.*—Why should a special design on drawing or model call for the 'per foot' rule? Why could not the articles have been supplied under item No. 2?

"*Ninth.*—Why was not such a rule adopted as to item No. 2?

"*Tenth.*—What general or special reason was there for inviting it in item No. 22?

"*Eleventh.*—The advertising for bids referred to the fact that the schedules, drawings, and designs were at your office, open to examination by prospective bidders. State when you first put them upon exhibition; state who examined them; state when they were examined; state who saw you in relation to them; state whether or not, if such people saw you, any difficulty was ex-

pressed by any one or more of them as to a comprehension of the basis of the bids. If so, state what objections were made, who made them, when they were made, and why, if such were the case, the schedules were not reformed, or a report made to the Board of Public Grounds and Buildings that the schedules were unintelligible?

"*Twelfth.*—Please consider all the foregoing questions, as relating to the 'per foot' rule, repeated as to the 'per pound' rule, in cases where such rule was adopted.

"Awaiting your reply, I am, very truly yours."

COMMUNICATION

SUING FOR BREACH OF IMPLIED CONTRACT.

PHILADELPHIA, Nov. 13, 1906.

TO THE EDITORS OF THE AMERICAN ARCHITECT.

Dear Sirs:—We have read with interest your editorial on the suit which has just been brought by us against the Board of Education of Newark, N. J. The "compelling cause" of the action was our desire to prevent a repetition of what is becoming too common, namely, the refusal to make any award after the holding of a public competition for designs. Such refusal not only causes much pecuniary loss to the architects who compete, but tends to discourage competitions and lower the standard of public work.

With regard to the damages claimed, the apparent ambiguity in the figures arises, we are advised, from the fact that in New Jersey the old common law form of pleadings is still followed, and instead of a concise statement of claim there is filed what are called common counts, with a large arbitrary sum stated as damage. These are accompanied by a bill of particulars, stating the real amount claimed. The amount claimed by us is $7,895.85, which was duly itemized in the bill of particulars, and is the actual loss to us, based upon the ordinary rates charged and received by us in similar work. Very truly yours,

RANKIN, KELLOGG & CRANE.

ILLUSTRATIONS

HIGH-SCHOOL BUILDING, FAIRHAVEN, MASS. MR. CHARLES BRIGHAM, ARCHITECT, BOSTON, MASS.: FOUR PLATES.

These views exhibit one of the several costly buildings with which Mr. H. H. Rogers has endowed his native town.

POST-OFFICE AND GENERAL-OFFICE BUILDING FOR THE NEW YORK CENTRAL RAILROAD, NEW YORK, N. Y. MESSRS. WARREN & WETMORE, REED & STEM, ASSOCIATED: GRAND CENTRAL STATION ARCHITECTS, NEW YORK, N. Y.

These plates exhibit the branch post-office building at the site of the Grand Central Station, now undergoing reconstruction, as it will for a while remain a low six-story building, and also as it will appear when completed as a lofty office-building.

[*Correction*:—We regret to have to call attention to the fact that the titles of the two houses at Poughkeepsie published in our last issue were accidentally interchanged.]

Additional Illustrations in the International Edition.

ENTRANCE FRONT: MAURITSHUIS, THE HAGUE, HOLLAND.

AMERICAN HOTEL, AMSTERDAM, HOLLAND.

THE UNIVERSITY, UTRECHT, HOLLAND.

THE CRYSTAL PALACE AND AMSTEL BRIDGE, AMSTERDAM, HOLLAND.

NOTES AND CLIPPINGS

THE TIBER OVERFLOWS ITS BANKS.—On November 3 the Tiber overflowed its banks in the country districts and is now threatening Rome. Venice is still under water, and gondolas are plying the Piazza San Marco.

AN UNNAVIGABLE IRISH CANAL.—There is in Connaught, Ireland, a remarkable curiosity, which gives an example of official oversight. When the great famine of 1847 was upon the land the government of the day conceived the idea of opening a line of navigation from Galway to Ballina, by way of Lough Corrib and Lough Mask, so as to avoid the dangers of the western coast. From Cong a canal was actually made to Lough Mask as part of the general scheme. The work gave a great deal of employment, and so far the canal served its purpose. But when it was completed it was found the canal would not hold water. The fact that the rock of the district is of a very porous character had been overlooked.—*Exchange.*

THE VALUE OF SUB-MONUMENTAL SCULPTURES.—The miniature scale of the recently erected Dürer monument at Nuremberg provokes a French journalist to reflection on the abuse of monumental sculpture. The statues, he feels, become embarrassing both from their number and their inhuman isolation. They stand blankly, cut off our view, and, as it were, look down upon us. With small statuary in public places the case is different; it meets us on our own level, and we establish a certain intimacy with it. Our critic likes to recall, for example, the small Dürer in bronze as a kind of patron and playfellow of the children who frequent the fountain at its base. The practice of nations who have had great sculpture, the Greeks, the Italians of the Renaissance, the masters of Gothic France, bear out this criticism. At the high periods of sculpture there has always been a good deal of what may be called a sub-monumental kind. The habit of cluttering the streets with heroic sculpture savors of Rome and the decadence of the antique. In any case, much of our public statuary sins in scale, and much of it would actually be more effective if of smaller dimensions.—*New York Evening Post.*

THE LADY AND THE TRACINGS.—The late Mr. Benjamin Ferrey, F.S.A., one of the most charming men I ever knew, was the architect of the new church at Otterton, and the late Mr. Burridge, of Exmouth, its general contractor, the sum spent being about £12,000. This amount was defrayed by the late Lady Rolle, of Bicton, a domain hard by, who some years previously (in 1851) also had the old church of St. Mary the Virgin at Bicton itself pulled down, and a new one (from the designs of the late Mr. John Hayward) erected in its place. Lady Rolle was an aged and extremely strong-minded old lady. Many stories were, and still are, told of her. Here is a characteristic one of an incident I personally witnessed while I was engaged upon the church in question. Her ladyship was accustomed, during the course of its erection, to visit the building several times a week, taking much practical and intelligent interest in everything that was done. In due course, the drawing for the pulpit was received from Mr. Ferrey's office in London. It was a comprehensive tracing, showing elevation, plan, and necessary details. Cloutman handed it at once to Lady Rolle, who, after a quick glance, waxed red in the face with rage, tore it in pieces, and, throwing the latter upon the ground, stamped thereupon. Then she turned to the trembling little clerk-of works and thundered: "Tell your master, from me, I will have original drawings, or none at all! How dare he send me a tracing?"—*Harry Hems, in Building News.*

BECKFORD'S FONTHILL ABBEY.—At a later date the immensely wealthy William Beckford, famed as the author of "Vathek," made the "smart set" of his day and generation mad with envy by piling extravagance upon extravagance and ostentation upon ostentation. The stories told of him in this respect are innumerable, and many of them are probably apocryphal. But one at least is true—that, namely, which relates to his bizarre attempt to build upon his Fonthill estates a duplicate of what he imagined Aladdin's palace—as described in "*The Arabian Nights*"—to have looked like. Marble, porphyry, jade, lapis lazuli, gold, silver, ivory, ebony—everything, in fact, that is most costly in building and decorative material—went to the erection of this gorgeous specimen of freak architecture. Wild tales were told of the barbaric splendor of its interior furnishing and fittings; but Beckford kept curiosity keenly alive by denying admission to everybody. Then, when at last the public grew weary of the subject, its owner set all the fashionable world agog again by announcing its sale by auction. Never before or since was excitement so keen in such connection. Eight thousand catalogues at a guinea apiece were disposed of. The sale, which lasted thirty-three days, was attended by over one hundred thousand people, most of whom had to camp out in tents, as there was no accommodation anywhere near for anything like that number. The gross sum realized for the building and its contents was £330,000, about one-third of what it cost.—*Tit Bits.*

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SOCIETIES, PERSONAL MENTION, ETC. . . . . iv.

THE writer has a fancy that during the more than thirty years he has been engaged in the conduct of this journal he has given quite as much thought and study to the matter of architectural competitions as has the friend who recently sent in a good-natured message that unless the *American Architect* ceased urging the merits of the "compound" competition, he would stop his subscription. Even the receipt of numerous similar admonitions seriously administered would hardly cause us to abandon our advocacy of a method of whose equitable merits and practicability we are so strongly convinced, and it is more than likely that, on proper occasion, we shall, with more or less frequency, rehearse the advantages of this form of competition and urge its general adoption. It is to be remembered that our interest in the matter is active only in so far as the expenditure of public funds for the erection of public buildings is concerned. We have little inclination to interfere with the right of private contract, and do not seek to prevent the individual from securing his architectural design by direct selection of an architect or through any form of competition that may commend itself to his judgment. But the public's right to secure with the public funds in the most certain way the best result that can be evolved by any architect, anywhere, willing to attempt the solution of the problem, seems to us incontrovertible. Having this strong feeling, it is distinctly a satisfaction to find it shared by the newly-elected President of the Royal Institute of British Architects, who in his annual address declares it to be his belief that *"it is to the interest of the public that a competition should be instituted for every proposed public building of importance."* It is to be observed, of course, that his opinion, like our own, is predicated on the assumption that the programme is properly conditioned.

POSSIBLY it is not for the interest of the elders of the profession, the "leading architects," the men who have "arrived," that the "compound" or any other, even the most strictly limited, form of competition should be adopted, since in the case of direct selection there is obviously the greater chance that the promoter will select from the few men who are popularly known as being at the top—to the manifest personal advantage of such leaders. It is not strange that the ardent advocates of the direct-selection method should be found amongst the few at the top rather than be discernible in the ranks where the majority of the practitioners are to be found, and it should be well worth the while of the majorities in the architectural societies to debate the question long and deeply before they allow themselves to endorse and recommend by formal action the theory of direct selection, knowing that such action, while it must abate their own opportunities, must aggrandize in still greater degree the opportunities of the men at the top, and knowing, too, that some of the men most widely known have attained their position through following the business methods of the shrewd advertiser rather than by reason of artistic ability. The returns that rightfully belong to the successful man accrue naturally and sufficiently: it is illogical that majorities, at their own cost and to their own damage, should magnify the opportunities of the few by giving official endorsement to the theory of direct selection in the case of public work.

IT is disappointing for one who has struggled to the top to find that he must keep on struggling and not be able to take his ease and pick and choose in a lordly way, but such struggling is not confined to the walks of architecture. It is humiliating, doubtless, for the acclaimed belle of several seasons to find her vogue suddenly eclipsed by the fresher charms and more piquant vivacity of a mere débutante, and in the same way a successful architect who has entered a competition for a public job, which he secretly believes ought to have come to him because of his reputation, must feel intense chagrin at finding the award go to an unknown man of half his years; but that is the law of life everywhere. The assumption that the best work is invariably done to private order or after direct selection is not borne out by the facts. Everyone knows that the important element of a design is the germinal conception and that is as likely to flash upon the designer when considering a competition programme as when mulling over the requirements of an individual client. Considering that most work is executed to private order, is there not a lamentable paucity of masterpieces around us? Mr. Collcutt, to whose address we have already referred, declares his belief that it "cannot be said with any approach to the truth that public buildings, where there has been no public competition, reach a higher standard" than is reached by those erected from competitive designs.

AFTER all, one of the most patent weaknesses in the theory of direct selection lies in the impossibility of devising a way in which such selection may be made with unerring satisfaction to the public. The regularly elected public officials would resent and resist having their power of selection and appointment curtailed in the

Entered at the Post-Office at New York as second-class matter.

matter of the public buildings erected for their own use and occupancy, yet can anyone imagine it would be safe to entrust such discretionary powers to public officials of the regulation type? Has not New York, in the last few years, demonstrated clearly what type of architect would be likely to be favored by politicians? Even if such officials can be high-minded and intelligent, is it proper to allow them to gratify their private friendships and personal tastes by dealing with the public funds quite as if they belonged to themselves alone? Direct selection and personal commissioning may be allowable enough in the case of a picture or a statue, for, in the first place, the cost is to be but a few hundreds or a few thousands of dollars, and in the second place the article, in case of failure, is going to be small enough to be displaced and hidden. But with a public building the case is different, the cost is likely to run into the millions, and in case of failure it cannot be removed, but must flaunt its defects forever in the face of the public who had a right that the public funds should be used to procure only the best result that could be secured.

BUT while Mr. Collcutt believes in competitions and is glad that a competition is to be held for the new County Hall to be erected by the London County Council, he "learns with dismay" that this competition is to be open to architects of all nations; yet, though the terms of competition are somewhat unpalatable because of this catholicity of opportunity, he does not, *more Americano*, suggest to the leading architects that they should mutually agree not to submit designs and so do what they can to force on the city a design prepared by inferior talent. *The Architect*, however, calls his attention to the fact that, besides merely following the example set by the Peace Palace competition, upon which Mr. Collcutt was one of the jury, the recent Congress of Architects in London adopted a resolution recommending that international competitions should be held for just such important public buildings as the proposed County Hall, and remarks that "there is not much use in a congress passing resolutions without opposition if they are not accepted as final and binding."

GREATER NEW YORK'S attempts to procure designs for its public buildings, whether by direct selection or by competition, have been amusing, instructive and—very expensive, though those attempts which have proved abortive are not necessarily the most expensive. The latest development in the long series of architectural contretemps comes to light in the form of a bill for thirty-two thousand dollars, presented by Messrs. McKim, Mead & White, for the design for a Borough Hall for Brooklyn prepared by them at the request of Mr. Littleton, the Borough President, but for which no appropriation could be secured before his term of office expired. It will be remembered that only a few months ago the city was obliged to pay to Mr. Washington Hull fifteen thousand dollars on account of work done by him in preparation for the erection of the same building after his successful competitive design, and Mr. Hull, furthermore, and with a good deal of plausibility, contends that the contract made with him by the city still holds good, and that, owing to its peculiar wording, he must be paid a commission on the building that finally may be erected, no matter who designs it. These unsettled claims must, it would seem, give much food for thought to the architects who are now reported to have been selected by the present Borough President to prepare a design for this much-needed building. There is luck in odd numbers, and so, perhaps, the third official in the series and the third architectural firm may have better luck than their respective predecessors.

IN this connection it may be well to recall that, though two competitions have been held to secure designs for a new City Hall for New York itself, the first won by the late C. B. Atwood, and the second by the late J. R. Thomas, in both cases the "leading architects" of the city mutually agreed together not to submit designs, on the grounds that the programme did not entirely meet with their approbation, and if public opinion had been unable to secure the preservation of the present building, McComb's masterpiece, it would have been a piece of undeserved good fortune, so far as the architectural reputation of the city was concerned, that men of such real ability as Atwood and Thomas decided not to be influenced by the example of the objectors. In each case the competition, despite its organic imperfections, was from the public's point of view successful rather than the reverse. What direct selection is likely to accomplish in the hands of politicians of the usual type may be inferred from the character of the design lately prepared in this way for the Borough of Richmond, which happily failed to receive the approval of the Municipal Art Commission. It might be argued that it would be entirely safe to vest the power of direct selection in the hands of a sublimated Art Commission, and so it might be, for a year or two. But it is commonly agreed that the reason the present Art Commissions are doing such excellent work is that their members serve without pay, and so none but really right-minded and public-spirited citizens are willing to serve upon them. But just as soon as the machine politicians understood that the Art Commissions were to have the power to deal out building jobs they would, even though the law provided that such Commissions must serve without salary, fill such Boards with their own creatures and see that they made handsome livings indirectly through sharing in the illegitimate profits on contracts.

THE news that the southwest tower of St. Paul's Cathedral, London, is settling and is already some thirteen inches out of plumb is very disquieting, when taken in connection with the rather serious settling of the east end some two years ago. Not only is there possibility that serious damage may finally be done to this important building, but, as the subsidence is unquestionably due to the tunnelling for underground railways, done or doing, in its immediate vicinity, the movement shows how serious may be the effect on existing buildings of the subterranean tunnelings with which the site of every large city is likely to be honeycombed before the present century closes.

CENTERING FOR CONCRETE BUILDINGS.[1]

EVERY one at all conversant with the cost of reinforced-concrete work knows only too well the disproportionate amount due to centering. In very heavy foundation work this proportion may not be excessive, but in some buildings of reinforced concrete the labor cost of installing and removing the wooden false work, together with the cost of the material itself, has made up 50 per cent. of the entire expenditure. (For admirable cost reports on a reinforced-concrete bridge, see *Engineering News* of March 2, 1906.)

The cost of the centering material itself is heavy and, when wood is considered, is growing heavier almost month by month. This is due to the constant and rapid increase in the prices of timber and lumber of all kinds, which has taken place during the past few months.

The first plan which comes to mind, looking toward the economizing of centering material, is to make repeated use of each piece. This can readily be accomplished where a building is largely a repetition from floor to floor or from bay to bay. But unless the structure is very large, a considerable time is lost through the necessary delays experienced while waiting for the concrete to set before the centers can be removed. This is the case, however, only where the concrete is handled in a wet state.

Consideration of these points led to the adoption for a series of one-story buildings of the method already described, *i. e.* casting on the ground the columns, beams, girders and roof slabs and of erecting them as structural steel is handled. For the moulds for columns cast on one side only three pieces are needed in place of four, if the column is moulded vertically. This effects a saving of 25 per cent. for column centering material. Further, little or none of the costly bolting or bracing is needed when the concrete has a depth of but a few inches, as is all that is necessary if the columns are cast on the side. Another advantage found with these column forms, which is also shared by the beam and girder forms under this method, is the fact that the side boards can be removed after 24 or at the most 48 hours, and used again two or three times during the intervals in which they must be left in place if the work is done in the usual way. This alone effects a 50 per cent. saving of material, as only the narrow bottom pieces are needed in any great numbers. In the special buildings described a much greater saving was effected in the centering for the roof slabs in the following manner: The ground floor (which consisted of concrete) was installed as soon as the girders and beams had been erected. On this flat surface ordinary smooth paraffined building-paper was spread, and the roof slabs marked out by narrow strips of wood of a width just equal to the thickness of the desired slabs. The reinforcing rods were then placed as required, and the cinder concrete spread to fill the moulds. In this way the regular floor formed the major part of the slab moulds, and the cost of centering material in this instance was almost nothing. (The ground floor might better have been laid before the slabs were moulded, the roof slabs cast as above described and the large members set up on top of the slabs.) A further saving in this material was effected by this "dry" method of construction, through the obviating of the necessity of using the almost innumerable vertical supports which serve to uphold the centers when the whole floor or roof surface must be built up in wood so as to form moulds into which the wet concrete is poured. These various savings effected in the material for centering cut its cost, on the particular structure in question, to less than 25 per cent. of what it would have been had the other method been employed.

In another building in which the "wet" method was used a saving of centering material was effected in the following manner: It was deemed best in this particular building to erect brick walls. It was then suggested that the brickwork be built first and that proper recesses and flue-like openings be built into the walls. Thus by using much fewer boards these recesses could be transformed into moulds into which the wet concrete could be poured. This concrete could be properly reinforced for the columns for the support of the building. In a similar way the beams and girders which were designed to come wholly or in part within the walls had the brickwork so built as to form a part of the bottom and at least one side of the forms.

An indirect method of saving centering material is to devise methods whereby a lesser amount originally purchased can be used more times and thus reduce the relative cost. One such device was employed with marked success on several large buildings, and the floor moulds for all parts except the girders were good enough for the whole of another building after having been used six or seven times in the first one. Instead of making the moulds for the beams in the form of boxes open on the top, and providing thin, easily damaged mould boards for the slab bottoms, the idea was reversed and slab bottoms were combined with the beam side pieces so as to make a box with its open side downward. This box was supported on cleats fastened to the lower outside edges of the girder boxes. Besides indirectly saving centering material, these boxes readily lend themselves to use as cores to effect a material saving of concrete, as has been mentioned above.

The cost of timber for centering is advancing so rapidly that the use of other materials is coming into greater and greater prominence. The use made of the brick wall described above could as readily be adapted to walls made of concrete blocks, whether the latter were cast *in situ* or on the ground and hoisted and placed "in the dry." If the price of lumber advances much higher it will be possible to make core-boxes of sheet-metal instead of wood, but in all essential respects like those mentioned above. There are on the market several patented systems of moulding concrete walls with wet concrete by making use of small metal moulds. The great disadvantage with most of them is the small size of the moulds employed, which thus increase the labor incident to the placing of only small quantities of concrete at any one point. After an investigation of these systems a slightly different idea was worked out with regard to the column moulds. Column forms built in accordance with this idea were used very successfully on two large buildings. Cinder-concrete shells 1½ inch in thickness were cast in proper moulds. These shells were piled up and properly wedged into position and served as the moulds into which was poured the concrete for the columns. High carbon steel wire spirals were used for the column reinforcement and these spirals were worked into the cinder shells so that no extra reinforcing was needed after the shells were put in place. Sheet-iron, bent into drums of the proper dimensions for the columns, formed the outsides of the moulds for casting the cinder shells and it was found most economical to employ for the inside cylinder moulds expanded-metal lath. The sheet-iron for the outside mould gave the outside of the cinder cylinders a smooth exterior surface (when the concrete was properly tamped), while the metal lath was fine enough in texture to prevent the concrete from running through its meshes more than enough to provide a perfect bond between the cinder shell and the concrete matrix of the completed columns. The process of preparing the shells was as follows: A collapsible drum was constructed, upon which was first wound the wire for the reinforcement. Outside of this was wrapped the lath, which was then fastened to the wire reinforcement by wire clips in the same manner in which metal lath is fastened together and to ordinary metal studding. The wire-and-lath cylinders were then placed inside the sheet-metal moulds and cinder concrete tamped between, to form the cinder shell. The metal sheets were held in proper shape and position by light wooden frames, built to the necessary shape and so bolted as to be easily removed. These forms and the metal sheets used for the outsides of the moulds were removed after 24 hours and used for other moulds; the platforms on which the cinder shells were cast being the only parts which it was necessary to leave untouched for longer periods. In this way the costs for the moulds for the cinder shells were reduced to a minimum and, since the sheet-metal could be easily lapped to any extent, the same sheets served to make shells of all diameters, from the largest to the smallest, and were still available at the end of the job.

These cinder shells have many advantages:

(a).—They form a fireproofing for the concrete columns, which are manifestly the most vulnerable parts of all concrete structures.

(b).—They do away with all column centering.

(c).—They carry the spiral column reinforcing in a manner very easily handled and with perfect certainty of no possibility of displacement.

(d).—They are capable of erection with comparatively unskilled labor.

(e).—They require forms for their manufacture which are of the simplest and, because of the possibility of repeated use, are of the cheapest construction.

(f).—Since round columns are the most efficient per square inch

[1] Extracts from a paper by Mr E. P. Goodrich, Am. Soc. C. E., read before a meeting of the Association of American Portland Cement Manufacturers.

of effective area, they provide the strongest column with a given area.

(g).—That portion of the concrete column which is not designed to carry any load is of poor quality material, thus making a column of slightly cheaper cost.

Turning now to the item of labor on the fabrication of centering, three points are potent in effecting economies:

(a).—Have as much work as possible done in regular shops so that considerable use can be made of machinery. By this means, too, piece-work can be employed with the resulting economies. For one building the core boxes described above were constructed in a planing mill and were delivered ready for erection. The wire-and-lath cylinders used in the cinder shells were similarly fabricated, and it is this same means which makes it possible to fabricate so cheaply the beam reinforcement in the somewhat complicated truss forms which are most effective.

(b).—Have as much work as possible so arranged that it can be executed by comparatively unskilled labor. The boxes described above were almost entirely handled and placed at the building by common labor, thus effecting a great economy over the usual methods, by which labor conditions required the employment of high-priced skilled labor for working wood.

(c).—Obviate as far as possible the use of the saw and the hammer. The first can be done by purchasing all material cut to sketch and by making it a cause of discharge to cut a piece of lumber. The hammer and nails should be replaced by bolts and a wrench.

The last item also goes far towards reducing the cost of removing the centering. Where the cinder shells were used there was no expenditure for removing column forms, and it was nearly a minimum where the "dry" method was employed. Of course, all builders use oil to coat the centers. A liberal use of this material greatly protects the wood against being damaged by its alternate wetting and drying. It also tends to give a good surface to the concrete, but best of all it largely reduces the costs of removing the centers.

Great care should be taken in the design of all centering, to make it as readily erected and removed as possible. It is believed that fully as much time can be profitably devoted in the office to the careful design of the centering for a job, as to the design of the reinforcement. At to the latter, it is believed that each beam and other member should be as carefully analyzed as are complicated plate girders. Regular strain-sheets should be prepared and preserved for record, and all elements carefully investigated. Another point for careful study in the office is that of reducing to a minimum the number of types of beam reinforcement to be used on a building. This item is even more important than in the design of structural steel work, where it is made a cardinal point. Reinforcement and centering should be made interchangeable from bay to bay and from floor to floor, as far as possible. Very often a design can be altered so that this can be effected with great economic advantage and with little or no loss of architectural or other feature.

Many of these points are only too obvious, but they have been included here in an endeavor to bring together as far as possible, in a short article, the most important points which tend toward economy, efficiency and excellence.

THE DEVELOPMENT OF IRON AND STEEL ROOF DESIGN.—II.

A TYPE of arched roof construction possessing distinct claims to recognition is that illustrated by the roofs of the Agricultural Hall and Olympia. At the time of its erection, in 1862, the Agricultural Hall had one of the largest roof spans in existence. The central arch measures 125 feet from centre to centre, and the two side arches are connected therewith, so that the whole forms a compound structure transmitting part of the thrust from the main arch through the side spans.

The roof of Olympia, designed by Mr. A. T. Walmisley, as joint engineer with Mr. Max am Ende, is worthy of special note, for the reason that the central span is an arch of greater width and height than is to be found in any other building in the metropolis, with the exception of St. Pancras station. The central span measures 179 feet between the columns, and the manner in which the horizontal thrust of the arch and the horizontal wind-pressure are taken up is distinctly novel. The whole of the gallery on each side acts as an abutment, and, as the columns are fitted with ball-and-socket joints at top and bottom, these members are always under axial load whatever may be the wind-pressure on the roof or the irregularity of the loads on the gallery at either side of the building. This roof was described in the *Builder* for 1887, where illustrations and full details of the construction will be found.

Arched roofs of great span like those at St. Pancras and some others which have been mentioned undoubtedly represent the safest form of construction, because their stability does not depend upon a single member, as in the case of trusses whose ends are held together by tension bars. By their adoption large spaces can be covered without intermediate supports, and for this reason such roofs are particularly suitable for large public halls. For railway stations they are far less suitable owing to the unnecessarily heavy cost and to the impossibility of providing in a suitable manner for the lateral extensions which are almost invariably required sooner or later, however large a station may be at the commencement.

To secure unobstructed space in railway stations at the lowest possible cost is a problem that has exercised engineers for many years past. In some of the earlier stations that were built small spans were employed with intermediate supports between the running tracks, the disadvantage of this practice being the obvious danger that the derailment of rolling-stock might displace one or more of the columns, and so bring down a considerable portion of the roof. Accidents of the kind have already occurred, and although the danger may not be very imminent in the case of terminal stations it is far more so at other stations through which trains pass at high speed.

As a compromise some stations have been built with roof spans of moderate width supported by intermediate columns in the middle of the platforms. Two examples of the kind are afforded by Broad Street and Liverpool Street stations.

Broad Street station, built in 1865, has roof principals which may be described as queen-post trusses surmounted by a cast-iron arched spandrel ridge. The station includes two roof spans of 95 feet, intermediate support being afforded by cast-iron columns, as represented in Fig. 9. The main rib is built up of wrought-iron structural sections; the tie-bar is of cylindrical section in eight lengths, the ends of which are forged out to form eyes. The struts are secured by pins to lugs on the main rib, and by bolts at the tie-bar, the diagonals being connected by means of pins, and attached to cast-iron fourway sockets at the points of intersection.

Fig. 10 is a diagram representing part of the older portion of Liverpool Street station roof, designed by the late Mr. Edward Wilson. This is an example of cantilever construction with spans of 109 feet between rows of columns rising from the platforms. The cantilevers are built up solid, and their extremities are connected by lattice girders. The subsequent extensions designed by Mr. John Wilson, the present engineer to the Great Eastern Railway, shows clearly that this method of construction lends itself very readily to enlargements required from time to time.

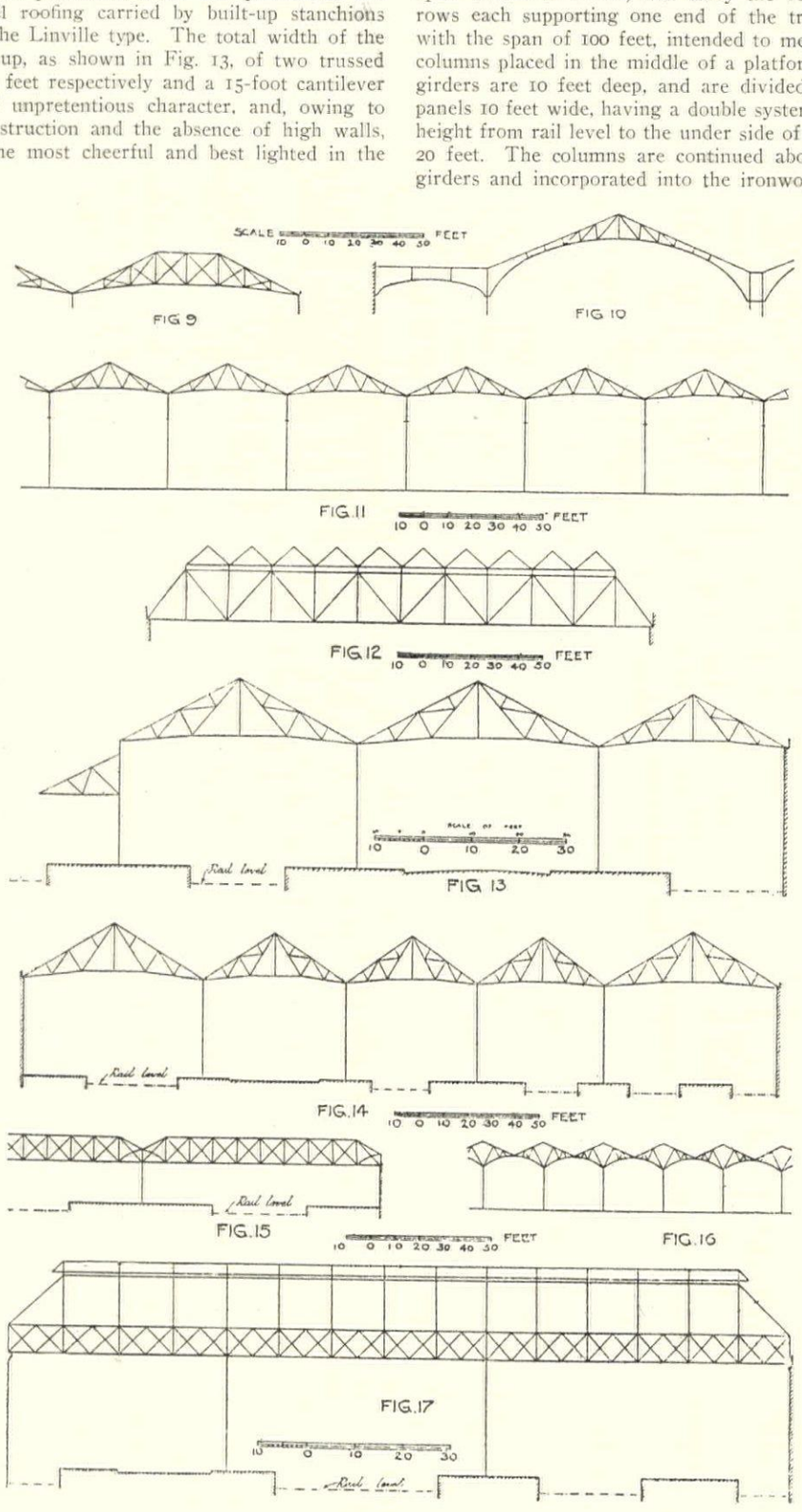
Another method of applying intermediate supports for a large railway station is illustrated by the old roof of Victoria station (London, Brighton & South Coast Railway), designed more than forty years ago by Mr. Jacob Hood, and now in course of replacement. Here, as shown in Fig. 11, continuous girders extend from one side to the other of the station, each with one intermediate column. These girders are 10 feet 9 inches deep and form two spans of 124 feet and 117 feet respectively, and carry 50-foot roof trusses of the queen-rod type, as represented in Fig. 11, which is a part longitudinal section. The use of girders in the manner described makes it possible to place supporting columns wherever they may be least inconvenient, and to carry out repairs or renewals at pleasure. Moreover, a station so built can be enlarged without demolishing any portion of the roof.

The Central station in Glasgow is spanned in a somewhat similar manner by seventeen deep latticed girders spanning the whole width from wall to wall, as shown in Fig. 12. The main girders are 213 feet 6 inches long by 20 feet deep, and carry ten ridge-and-furrow roofs, of 35-foot span, the ends of which rest upon the top flange of the main girders, so that the ridges are parallel with the longitudinal axis of the station.

There is a somewhat similar example at Derby, where the principals of the Midland Railway station are connected a little above the bottom flange of transverse girders. This arrangement has the advantage of shielding the greater part of the main girders from the deleterious gases given off by locomotive engines.

Among roofs of recent construction, that of Marylebone station is a good example. The platforms, lines and promenade are covered with light steel roofing carried by built-up stanchions and arched girders of the Linville type. The total width of the roof is 155 feet, made up, as shown in Fig. 13, of two trussed spans of 50 feet and 40 feet respectively and a 15-foot cantilever span. This roof is of unpretentious character, and, owing to the elegance of its construction and the absence of high walls, the station is one of the most cheerful and best lighted in the metropolis.

The new roof now being built from the designs of Mr. Chas. L. Morgan in connection with the extensive widening operations at Victoria station (London, Brighton & South Coast Railway), London, is an admirable illustration of sound engineering design, complying alike with the requirements of traffic and the safety of the public. The total width covered, from Buckingham Palace Road to the South-eastern & Chatham Railway, is about 320 feet, the roof being divided into five spans of varying width and height. The main principals are spaced 16 feet 8 inches apart; every third principal is carried on one of a series of cast-iron columns, spaced 50 feet apart; and the others on latticed girders connecting the columns, the latter being arranged along the centre lines of the platforms, where they are safe from accidental injury. A portion of the new roof is illustrated in Fig. 14, the dimensions of the chief members in the roof trusses being as stated below: The main rafters are formed of two 18-inch by 3-inch channel-bars; the main tie-bar consists of two 6-inch by 3-inch tee-bars in each side length and two 4½-inch by ½-inch flat bars in the centre length; in the bracing the struts consists of channel- and angle-bars of different dimensions, single or duplicate according to position; the ties are flat bars of different dimensions, single or duplicate, according to positions; and the vertical tie in the centre is a 1¼-inch diameter eye-bar, provided with a screwed turnbuckle for purposes of adjustment.



A design presenting features of decided novelty is that proposed by Mr. A. T. Walmisley for the new Marine station on the Admiralty Pier, Dover. Figs. 15 and 16 represent respectively part transverse and longitudinal sections of the roof. According to the scheme contemplated by the designer the station is to be 800 feet long by 200 feet wide, but these dimensions are not yet finally settled. Three rows of cast-iron columns, spaced 26 feet apart centre to centre, will carry the roof structure, the outer rows each supporting one end of the transverse lattice girders with the span of 100 feet, intended to meet at the centre row of columns placed in the middle of a platform 60 feet wide. These girders are 10 feet deep, and are divided by vertical struts into panels 10 feet wide, having a double system of diagonal ties. The height from rail level to the under side of the girders will be only 20 feet. The columns are continued above the bearings of the girders and incorporated into the ironwork of the double cantilever roof principals, which form 25-foot spans and somewhat resemble the cantilevers of the Forth Bridge in outline. The cantilever arms project 12 feet 6 inches, and their ends carry the roof gutters, which discharge through the centre rows of cast-iron columns. It is proposed that the seaward side of each roof ridge shall be covered with sheet copper laid over felt and boarding, and the other side by glazing. Timber has been selected for the purlins instead of iron, owing to its immunity from injury by the steam and gases emitted from locomotives, and for the same reason wrought-iron is specified instead of mild steel for the roof-work generally.

The three foregoing types of design are sufficient to demonstrate the reaction that has set in against roof spans of exceedingly large proportions, and the new roof designed by Mr. P. C. Tempest for Charing Cross will serve to emphasize the same characteristic.

The new covering for this station is shown diagrammatically by the cross section in Fig. 17, being designedon the ridge-and-furrow system, with ridges running at right angles across the station. The principals will be carried by latticed girders extending from side to side of the station, and these girders will be supported by the lowered side walls and by two lines of columns placed in the middle of the platforms. The total height of the roof will not be more than about 35 feet to 40 feet above rail level, and, owing to the reduced height of the side walls, abundant provision will be made for the admission of light, to say nothing of the other manifest advantages of the new structure.

The reason for adopting this type of design was that it will be possible to construct the transverse girders in such a way that the columns may be moved within reasonable limits to suit any rearrangement of the platforms that may become necessary, and thus to save any alteration to the structure of the roof in case

widenings should be undertaken on either side of the present station. At the same time the new roof will conduce to the safety of the public, give increased facilities for maintenance, and provide for the ready escape of steam and gases.

The development of iron and steel roof design on a large scale forms a most interesting study, which is naturally too extensive for adequate treatment in an article such as this. Those who wish to pursue it further will find abundant material in the *Proceedings* of the Institution of Civil Engineers and in the pages of various engineering publications, but for readers who have not an extensive library at command the most convenient source of information is Mr. Walmisley's well-known work on iron roofs, which describes and illustrates many such structures erected up to the year 1887, and from which we have prepared the diagrams of some of the earlier roofs mentioned in this article.

The most recent examples of construction serve to demonstrate the fact that the monumental roof is no longer thought to be a necessary feature. It is certain that the railway station of the future will be of far less pretentious character than heretofore, and at the same time less costly and better adapted to its intended purpose.

It seems probable, in fact, that the desire to reduce initial expenditure, to avoid the unnecessary risks attached to large spans of certain types, and the great cost of maintaining those of other types, and to obtain facilities for extensions required from time to time, will finally lead railway companies back to the practice of simply covering the platforms of their stations, leaving open spaces between the lines for the free escape of steam and smoke and for the ready admission of light and fresh air.

In justice to the designers of railway-station roofs, it must be pointed out that the fashion for ostentatious spans did not originate with them, but with traffic managers, who thought it desirable that the whole interior area should be absolutely unimpeded by column or interior supports. Fifty years of experience have served to dispel this notion, and we are now on the point of returning to the less ambitious ideal which possessed engineers in the early days of the railway system.

Important public buildings, of course, stand upon another footing, and naturally must be covered in a manner dictated by architectural requirements and the purposes to which they are destined. —*The Builder.*

TRAJAN'S COLUMN.

THE announcement that Professor Giacomo Boni has been able to complete his restoration of Trajan's Column in Rome must give satisfaction to archæologists. He was allowed to explore beneath the column partly in the hope that some relics of ancient art might have survived. It was recorded that the ashes of the emperor were placed in a golden vase and deposited in the earth on which the memorial was raised, while according to other accounts the globe in the hand of the statue contained them. Many centuries back efforts were made to obtain the vase, and the excavations then carried out did not add to the safety of the column. By means of the careful underpinning which Professor Boni has been able to perform the great work is now almost as secure as when it was originally completed in A. D., 114. Fifteen fragments of the large swags above the pedestal were recovered and refixed approximately. . . .

Like his predecessor, Trajan constructed a forum, and it must have been a magnificent work. According to one authority it had a roof of bronze. On two sides there was a double row of columns. The triumphal arch was at one end and the memorial column stood in the opposite extremity in an open space between two great libraries. Within the enclosure was a basilica. Professor Boni has revealed the foundations of the libraries, one of which it is believed mainly contained Latin manuscripts and the other Greek. The character of the shops and other buildings connected with the Forum has to be left to imagination. There was an abundance of gilded figures and an equestrian statue which was supposed to be inimitable by other emperors. Trajan's Forum must have been impressive, for, according to a legend, Gregory the Great obtained the deliverance of the emperor's soul from Purgatory through admiration for the place.

The column, which fortuntely has survived, is well known from engravings, and there is a cast of it at South Kensington. It is believed that the architect employed to design all the buildings in the Forum was Apollodorus, who, if reports are true, was murdered out of envy in the next reign by Hadrian. But although upheld by the authority of Dion Cassius, modern historians are doubtful of the truth of the latter allegation. We may therefore suppose that the column was designed by Apollodorus.

A column which fails to support something is illogical. In this case there was a bronze statue of the emperor over 20 feet in height. It was overthrown, and it is believed that some of the pieces of marble which Professor Boni recovered were broken from the pedestal while the figure was falling, or clumsily taken down. It was also resolved that, in addition to serving the purposes of a column, it should become an historical memorial by sculpturing the shaft with scenes from Trajan's contest with the Dacians. These people occupied districts near the Danube: and in Transylvania a plain where one of the battles was fought is still known as the Field of Trajan. It is believed they were Thracians, and they certainly were among the most troublesome enemies of the empire. Trajan had to undertake two expeditions against them before he could be assured that they were conquered.

It has been calculated that about 2,500 figures are represented in the spiral, exclusive of the boats, horses, military engines, trophies and other objects. Like the frieze and metopes of the Parthenon a great many sculptors were likely to have been employed on the work. But there can be no question the design came from one artist, who was likely to be Apollodorus. Care was taken to avoid degrading the figures of the Dacians, and if they corresponded with the representations they were well worthy to struggle for independence against Rome. With such evidence Byron was justified in assuming that the statue commonly called "The Dying Gladiator" represented a Dacian warrior. The figures gradually increase in size in proportion to the height. While they are 2 feet at the lower part of the shaft they are nearly 4 feet at the capital. The Romans of the Second Century must have had better eyes than the majority of present-day visitors, if they were able to make out details which were so closely packed. The whole of the figures have fortunately been engraved in De Rossi's book on the column. . . .

The column is of Roman Doric. The height has been variously estimated. It is generally supposed to be 97 feet without the pedestal and 115 feet with it. It is therefore about 20 feet higher than the York Column, but nearly corresponds in height with the column in the Place Vendôme in Paris. The shaft is said to consist of twenty-three blocks of white marble. Joseph Woods, who appears to have scrutinized the construction of the column, says that "in this case it appears that the Romans, instead of making a flat and horizontal joint, formed a variously and irregularly undulating surface on the one piece and cut the other to correspond with it, a laborious and difficult process, of which the object seems to be merely to hide the joint, for the strength of the column would not be increased by it." The diameter of the column at the base is 12 feet and at the summit 10 feet. The pedestal is adorned with representations of Dacian arms and other trophies. . . .

Inside the column is a winding staircase of 185 steps. There is some uncertainty as to whether the statue of Trajan remained perfect or whether there was left only a fragment of it when Pope Sixtus V. ordered Tommaso Della Porta to model the statue of St. Peter which now stands upon the column. It is an anomalous crowning for the memorial, and it fails of its effect, for as long as Rome endures the column will be known as Trajan's, unless in some fanatical outbreak it is reduced to dust.—*The Architect.*

THE PEACE PALACE COMPETITION.

IN his annual address, Mr. T. E. Collcutt, the new President of the Royal Institute of British Architects, made the following very plain-spoken comments on the outcome of the Peace Palace competition:

"I FEEL sure it will not be thought out of place, especially by our younger members, if I say a few words on the momentous question of public competitions. It has recently been suggested that, in competitions for buildings of any magnitude, the responsibility of selection becomes too onerous to be entrusted to one assessor, and that competitors would feel greater confidence in the judgment of two or more.

"I entirely disagree with this idea, and to illustrate my opinion I venture to remind you of the result of the competition for the proposed Peace Palace at The Hague. This competition, being of an international character, it was decided to invite six architects, representing various countries, to act as a jury of selection. Our Foreign Office requested the Institute to nominate an archi-

tect as representative of Great Britain, and our Council did me the honor to elect me to this post.

"During last April I met my brother assessors at The Hague, and we forthwith embarked on the work entrusted to us. Our committee consisted in all of seven assessors, the President of the Peace Congress acting as chairman, and voting with the six architect jurors. In my opinion, the combined efforts of the seven jurors resulted in disastrous failure.

"To my mind the design placed first in order of merit should not have been placed at all. The instructions to competitors issued by the Peace Committee stated the proposed limit of expenditure. Now, all the assessors agreed that the cost of carrying out the selected design would be no less than double the amount specified. Nevertheless, the jury decided by a bare majority that this design should receive the first premium in virtue of the excellence of its plan. It appeared to some of us that this plan possessed undoubted merits, but that these merits existed only because the designer had utterly ignored the limitation of the proposed expenditure. He would probably be obliged to remodel his plan in order to reduce the cost to a sum approximate to that at his disposal, and the special features that had attracted the assessors would thus be either eliminated altogether or else remodeled to such an extent as to lose the characteristics which had made them specially attractive.

"With regard to deciding what style of architecture would be most suitable for a monument of international peace and harmony, the majority of the jury inclined towards the Dutch style of the XVIth and XVIIth centuries. On the other hand, a minority was in favor of a style common in some degree to most European countries. This minority considered that an adaptation of Italian Renaissance would be more international in character and more suitable in every way than any treatment of Dutch architecture could possibly be. However, the wishes of the majority prevailed. In spite of this, the principal characteristics of the design finally chosen were those of a French château; but I venture to think that this style of architecture, as illustrated by the successful designer, is not quite appropriate to a public and international building.

"I have dealt fully, I fear even tediously, with this subject, because I think the result of the competition indicates that the question of assessors requires careful consideration. Should there be one assessor or a jury of several? My experience at The Hague leads me to the conviction that, when more than one assessor is appointed, an altogether futile conclusion is likely to be the consequence. In this case, as I have pointed out, we were six architects, with a layman as chairman. The result of our combined labor was the choice of a design which we all agreed could not be executed under double the amount quoted in the instructions to architects. The design chosen was crowded with picturesque towers, gables, and roofs, most of which were quite unnecessary. As a supplement to our Report we wrote a joint letter to the Permanent Committee wherein we advised that the future buildings should be monumental in character and without exuberance of ornament. We suggested that such extraneous features as towers, cupolas, etc., should be considered with the utmost reserve, and in this way our previous decision was completely stultified.

"I think I have shown that the final decision was a stupendous failure. It is probable that when more than one assessor is appointed the sense of individual responsibility is lessened. Perhaps each member of such a jury undertakes his arduous task with a feeling that the final result will be more or less in the nature of a compromise. In a jury of assessors there is also the possibility of a minority report, which may lead to difficulties with the employers, and perhaps to the abandonment of the awards.

"To my mind the ideal arrangement for deciding important competitions is the appointment of one chief assessor aided by one, or preferably by two, assistant advisers to whom he could turn for counsel or help. The assistants or assistant should have no voice in the ultimate decision; the entire responsibility should rest with the chief assessor.

"Although I am of opinion that The Hague competition was a failure, inasmuch as the best designs were overlooked, I do not wish to infer by this that I think competitions are a mistake, and that they fail to secure the best possible designs. On the contrary, I believe that it is to the interest of the public that a competition should be instituted for every proposed public building of importance. I do not deny that there may be many exceptions to this rule. The new Scotland Yard is a notable instance of such an exception; but the architect of that noble work stands by himself, as is recognized, I think, both by the public and by the architectural profession. It is said that buildings erected from competition designs fail more or less in reaching a high standard of architecture. There is, of course, a good deal of truth in this criticism, but I think it cannot be said with any approach to truth that public buildings where there has been no competition reach a higher standard.

"I think, in the interests of architecture, that every means should be taken to secure the best design possible, and, as a rule, this can be done by competition. Competition is also invaluable to the young architect for reasons beyond that of striving for a first prize; it gives him the opportunity of comparing his work with that of others and of taking home to himself, if he is modest, his weaknesses. Beyond this there is the chance of discovering genius which otherwise might strive in vain to make itself known."

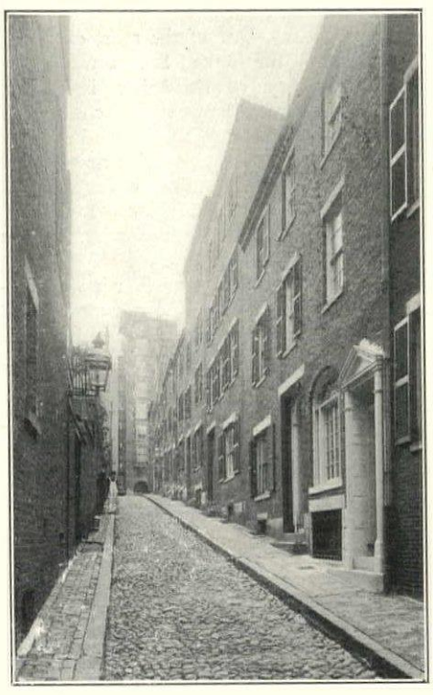
ILLUSTRATIONS

STORE ON TENTH STREET, N. W., WASHINGTON, D. C. MESSRS. WOOD, DONN & DEMING, ARCHITECTS, WASHINGTON, D. C.—STABLE OF JAMES HENRY SMITH, ESQ., WEST FIFTY-FIFTH STREET, NEW YORK, N. Y. MESSRS. WARREN & WETMORE, ARCHITECTS, NEW YORK, N. Y.

HOUSE OF S. E. BUCHANAN, ESQ., 109 WILLOW STREET, BROOKLYN, N. Y. MESSRS. KIRBY, PETIT & GREEN, ARCHITECTS, NEW YORK, N. Y.

ALTERATIONS ON ACORN STREET, BOSTON, MASS. MR. FRANK A. BOURNE, ARCHITECT, BOSTON, MASS.

When, a quarter of a century ago, the "made land" of the Back Bay district was ready for use many old families who had been content to live in quietness in houses on the streets crossing the north and west slopes of Beacon Hill deserted their old houses for new ones built on the broader streets of the new territory. People of the same class shared their inclination and declined to fill up the houses left vacant and the owners had to seek tenants from less aristocratic classes. In this way the character of the population changed materially and a considerable portion of the territory was absorbed by negroes, while another portion was appropriated by stablemen and acquired the air of a series of London mews. Latterly, there has been a disposition to reclaim some of those streets, as bachelors found them very conveniently located with reference to the club-houses. Among others, Acorn Street, one of the shortest and narrowest streets in the city, has been retenanted by lawyers, architects, artists, and others who appreciate quiet respectability more than the garishness of "all modern improvements."



COTTAGE AT LANCASTER, MASS. MR. H. D. CARTER, ARCHITECT, CLINTON, MASS.—COTTAGE AT CLINTON, MASS. MR. HENRY FORBES BIGELOW, ARCHITECT, BOSTON, MASS.

HOUSE OF DR. FOLTZ, CHESTNUT HILL, PHILADELPHIA, PA. MR. G. T. PEARSON, ARCHITECT, PHILADELPHIA, PA.—HOUSE AT LYNN, MASS. MR. E. M. A. MACHADO, ARCHITECT, BOSTON, MASS.

INTERIORS IN HOUSE OF DR. FOLTZ, CHESTNUT HILL, PHILADELPHIA, PA. MR. G. T. PEARSON, ARCHITECT, PHILADELPHIA, PA.

A RECONSTRUCTED THOROUGHFARE [STRASSENDURCHBRUCH] SANCT JOHANN ON THE SAAR, PRUSSIA.

This plate is copied from *Blätter für Architekteur.*

Additional Illustrations in the International Edition.

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NOTES AND CLIPPINGS

PARIS ABATTOIRS.—There are in Paris three principal abattoirs, the largest of which, La Vilette, is in the northern quarter of the city; Vaugirard, which was opened in 1898, and replaced the old slaughter-house of Grenelle; and Villejuif, where horses are slain for food. Any butcher may slaughter animals at these abattoirs on payment of a tax of 2 francs (40 cents) a hundred kilograms (220 pounds) on the meat so prepared. Butchers of the more important class and specially licensed are permitted to sell the meat which they have thus provided directly to the smaller dealers who keep retail meat stores throughout the city. Inspectors are in constant attendance, and any meat found infected with disease or otherwise unfit for food is saturated with petroleum and condemned. Prior to the year 1810 the butchers of Paris slaughtered animals in the streets and public squares, but at that time municipal slaughter-houses—"abattoirs"—were established where animals intended for human food are inspected and the whole process of slaughtering and disposal of the meat and offal are kept under official surveillance.

ELECTRIC POWER FOR MINNEAPOLIS.—One of the most extensive developments of electrical power in the United States, which will be ready for utilization by the first of December, is that at Taylor's Falls, on the St. Croix River, between Wisconsin and Minnesota. Here some eighteen months ago work was begun on a mammoth dam and electric power-house, where electricity might be generated for the Minneapolis market. This undertaking is now practically completed, at an expenditure of $3,500,000. Within a month the partial development, amounting to 12,000 horsepower of electrical energy, will be available in Minneapolis for manufacturing purposes. The ultimate development will render available between 25,000 and 30,000 horsepower. The advent of electricity as a manufacturing power opens up a great field for Minneapolis, especially when economy favors its use. Electricity generated at a distance by waterpower settles at once two great problems, those of fuel and of smoke. Before a bit of work could be done on the St. Croix, over a half million dollars had to be expended to secure flowage rights. Twenty-one miles of shore line on both sides of the river were bought, and to the ten miles of backwater formed by the new work may be added another eleven miles of pondage which has also been secured. To-day the plant consists of a completely equipped modern power-house and dam, and a transmission line 40.67 miles in length, which carries the current in almost a bee-line to the sub-station in northeast Minneapolis. The dam is of solid concrete 700 feet long, 50 feet high, 40 feet thick at the base, and 10 feet wide at the top. It is equipped with long sluices, a fishway, and a spillway, and will last practically forever. The dam extends diagonally across the river from the town of St. Croix Falls on the Wisconsin shore to a point above Taylor's Falls on the Minneapolis side. The huge power-house, also of solid concrete, is erected on a solid rock ledge on the Wisconsin side. A canal cut through the solid rock, 125 feet long and 50 feet wide, leads to the wheels, where an effective head of 55 feet is secured. Current will be generated at 2,300 volts, raised for transmission to 50,000 volts, at which voltage it will be received in the Minneapolis sub-station, and there transformed to a lower voltage for commercial use. This great increase in Minneapolis's power for manufacturing is expected to be a wonderful factor in the city's industrial development during the next few years.—*New York Evening Post.*

A MEDIÆVAL ACROSTIC.—At Pieve Terzagni is a church which belonged to a castle of Countess Matilda. The mosaic pavement, which may probably be of her period, is like a carpet, with twelve larger and six smaller medallions, in which are animals and a double-tailed syren. The apse is a step higher, and here behind the altar are the symbols of the Evangelists, a gryphon, a square with some pattern-work, and a portion of a figure beneath the arch, with an acrostic inscription, which is thought to refer

S A T O R
A R E P O
T E N E T
O P E R A
R O T A S

to a certain Arepo or Erbo, whose portrait is just below, perhaps the priest of the place.—*The Builder.*

RESULTS OF GERMAN STATE INSURANCE.—The twenty-fifth anniversary of the late Prince Bismarck's announcement in the Reichstag that the Emperor was determined that the State should systematically assist the working people, male or female, by accident, sick and old age insurance, was commented on widely in the German press recently, which generally approved or disapproved the results, according to the political opinions of the commentators. The Socialists, following the policy which they adopted when the laws were passed, found fault with the insurance as being inadequate and not radical enough really to provide "for the casualties in the industrial warfare and the disabilities of those worn out in the service of capital." But the whole body of Liberal and Conservative opinion appeared convinced that the laws are beneficial. During the last twenty years $555,750,000 has been paid out for sickness, $232,750,000 for accidents and $13,500,000 for old age. The sum of $312,500 was expended daily on the combined objects, the total of the various funds is $375,000,000, the total amount paid in since the law was passed is $1,656,750,000, and sixty million persons have profited by this legislation.—*Boston Transcript.*

AMERICAN EPISCOPAL CATHEDRALS.—Buildings worthy the name cathedral have thus far been erected in only two dioceses. These are Albany and Long Island, the former the personal ambition of the first and only bishop the diocese has ever had, Right Rev. Dr. William Crosswell Doane, and the latter thrust upon Garden City through the schemes of the late A. T. Stewart to develop a land project. The Garden City Cathedral was erected with Stewart funds and has a modest endowment for its support. The most ambitious cathedral project in America is that of St. John the Divine, on Cathedral Heights, New York City. This structure is to cost $10,000,000 and to have $10,000,000 endowment. Bishop Potter was urged by the late Cornelius Vanderbilt to build a modest cathedral, to cost a million or so, and he is said to have offered the bishop the million needed. The bishop declined the offer, and then announced his intention to lay plans for a cathedral so large that his successor could not contract the lines and keep his reputation. San Francisco is rejoicing over the gift to the California Diocese of the whole block on Nob Hill formerly occupied by the Crocker mansions. It is one of the most commanding sites in the world, and will do a great deal to strengthen the Episcopal Church on the Pacific Coast. It is announced that the name to be selected will be Grace Cathedral, after the name of Grace Parish, which lost its church in the recent fire and is now to be merged into the cathedral foundation. There are four or five dioceses whose bishops affect the cathedral form and have modest buildings which are termed cathedrals. Among these are Fond du Lac, where the ritualist Bishop Grafton resides, Milwaukee, Omaha and Laramie, Wyo. There are some bishops who have what they call cathedrals and they maintain in part the staffs of cathedrals. Among these are Bishop Tuttle of Missouri, Bishop Woodcock of Kentucky, and Bishop Codman of Maine. Five see cities in America and two outside of it have definite cathedral projects on hand. One of these is Denver, where there used to be a cathedral, but it burned; and now on a new site, quite near to the Capitol, a new cathedral far surpassing the old one is to rise. A second is Cleveland and a third Memphis, in both of which fine structures are nearing completion. Boston has funds in sight large enough in amount to make a beginning of a cathedral foundation, and the plan of having such an establishment is everywhere received with satisfaction. Washington, the national capital, has a vast cathedral project on hand, the site of which has been selected and two cathedral schools founded and put in operation.—*Boston Transcript.*

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IN looking over the form of indenture which a father or guardian has to sign when a boy is placed as a "pupil" in an English architect's office, we were struck by the clause which covenants "that he [the pupil] shall and will, during the said term of years, loyally execute and perform the lawful instructions and directions of the Principal, and serve him as his Pupil and his secrets keep in all matters relating to the said Profession and other Business of the Principal." Rather a pregnant provision that "and his secrets keep," and it set us a-wondering whether in this country architects take proper care to assure that the draughtsmen they employ shall their "secrets keep." The old-time loyalty that used to subsist between architect and draughtsman, the time when a draughtsman felt sure that he would receive his pay throughout the year, even though slackening of work obliged his employer to go without profit, has very largely disappeared in these days, owing to the commercializing of the relations which exist between the architect and his helper. If the latter feels, as he does, that he is "likely to be fired" as soon as work slackens and it becomes good business to reduce expenses, why should he concern himself to be loyal to his employer and "his secrets keep"? At times we have been conscious that "things," of distinctly private import, got into the daily papers and professional journals which could only have got there because someone did not his employer's "secrets keep."

A CASE in point is—or at least it may be such—the attempt now making to provide a high-school building for Pittsburgh, Pa., an attempt which has been surrounded with a variety of complications having more than the common amount of unpleasantness intermingled. There have been quarrels about the selection of a site, there have been quarrels as to whether the design should be procured by competition, open or limited, or by direct selection, there have been injunctions and further quarrels in the Board of Education. Finally, matters were allowed to make progress, and, with Professor Laird as expert-adviser, a limited competition has been held with five Pittsburgh firms and five selected from elsewhere as the competitors. The result of further acrimonious discussion has been the selection of a design submitted by a Pittsburgh firm, Messrs. Rutan & Russell, and it will surprise no one to learn that as soon as the award was announced there was a further outbreak of unpleasantness, during which it was plainly charged that certain members of the Board of Education knew from the outset which design had been prepared by the men to whom the award finally went. Naturally, Professor Laird is indignant, and protests that the most scrupulous care was taken to preserve the anonymity of the competitors, and, as naturally, Messrs. Rutan & Russell, men whose reputation is excellent, protest with even more indignation that they, of course, had no hand in making known to any one the character of the design they were submitting. Nevertheless, the testimony tends to prove that it was known to some of the Board of Education that the Rutan & Russell design could be identified because its assembly-hall and gymnasium were disposed thus and so.

WE do not for a moment feel that either the expert-adviser or the competing architects was at fault. We believe that here, as in many similar cases, the mischief was done by some draughtsman who did not "his employer's secrets keep," but intentionally or unintentionally, maliciously or innocently, discussed somewhere, with somebody, the character and arrangement of the design his employers were to submit, and that by this channel the identifying facts were finally made known to members of the Board, accidentally or intentionally, as the case may be. Against intentional or malicious misfeasance an architect can have no protection, but against the mischief-making of an innocently loquacious helper many precautions can be taken, the best of them perhaps being the building up of a mutually loyal relationship between the architect and each one of the men he employs.

TO most of our readers, Samuel Cabot, who died last week at the age of fifty-six, and whose name has long been "familiar as a household word," was merely a man who manufactured a very excellent line of shingle-stains; but he was a great deal more than this, for, though nominally a manufacturing-chemist—a term which often applies to a man who pursues dollars rather than science—he unquestionably deserved to be considered a man of science, and a broad-minded one, actively interested in more fields than one. It is doubtful if his schoolmates ever have overcome their feeling of surprise that the rather sluggish, clumsy and unpromising boy they once knew was developing into a man whose scientific attainments were widely recognized, who was quietly securing a recognized position in the community, whose judgment was respected and whose opinion on matters of general civic interest was sought. A graduate of the Massachusetts Institute of Technology, he later became a member of its Corporation, and a year ago was one of the most confirmed advocates of the proposed merger of that institution with Harvard University. Although occupied in building up, from nothing, a large manufacturing plant

Entered at the Post-Office at New York as second-class matter.

that furnished a great variety of the useful products obtained from coal-tar, he found time to give serious attention to the study of aerostatics, and experimented with kites and aeroplanes. Becoming much interested in the Shakespearean controversy, he spent much time in counting the words and syllables in several of Bacon's essays and Shakespeare's plays in order that he might plot out parallel sets of curves which proved to his own satisfaction and that of other adherents of the Baconian theory that the plays and the essays had the same periodicity of accent and syllabication, and were, therefore, the work of the same hand, and that hand Bacon's.

AT length a finding has been filed in the matter of the building that collapsed during erection, at South Framingham, Mass., on July 23 last, causing the death of twelve persons and the injury of several others. It will be recalled that the building was of rather a complex structure, steel, concrete-blocks and reinforced-concrete seeming to have been used in some sort of combination; so it was not the easiest thing in the world to arrive at a plausible explanation of the accident. Mr. George A. Winsor, who was charged with the investigation, finds that those responsible for the building must have had notice that matters were going wrong, since he found clear evidence that attempts had been made to shore up a wall in which cracks had appeared. The probable cause of the collapse he finds in the concrete footings prepared for the basement piers. These footings were seventeen inches deep, and, owing to the nature of the site, they must have been cast in forms in which the water stood to a depth of fifteen inches. On examining these footings he finds that though the upper portion was sound, the bottom five or six inches was in poor condition—in some cases it could be crumbled with thumb and finger, and from this he infers that the concrete was dropped from a considerable height into the water-filled forms, thus allowing the cement to be pretty thoroughly washed from the aggregate. Possibly there may have been good reason for making the always doubtful attempt to lay concrete under water, but, so many other evidences of incompetence came to light after the collapse, we incline to feel that the leaving of water in such shallow forms was only one more item of inexcusable carelessness.

MORE promptly, a report is made upon the collapse, on November 21, of a reinforced-concrete building which was being erected for the Eastman Kodak Company, at Rochester, N. Y. The County Engineer, Mr. J. Y. McClintock, finds that a reinforced-concrete column which had to carry 596 pounds per square inch was so built that it could not possibly carry more than 500 pounds, and that the column was built as it was, was due to negligence in construction. This, we suppose, will somewhat lighten the load upon the conscience of the designer of the structure—four lives were lost—and perhaps tends to place the responsibility on "cheap labor," that overvalued factor in the merits of reinforced-concrete work. The column was twelve inches square and over seventeen feet high, reinforced by four rods extending through the full length, and by subsidiary rods through the lower ten feet of length. As we understand the testimony, these subsidiary reinforcements were lacking in the column that gave way, but the rods that should have been used there were found in the body of the next column, which seems to have received a double dose of the shorter rods. If this really states the situation, it would seem that these rods must have been dropped into the forms from above and left to discharge their expected function in a very hit-or-miss manner, which rather invited failure. Eternal vigilance must be the attribute of the clerk-of-works put in charge over reinforced-concrete work, if it is hoped to have it sound.

AT the dedication last week of a boys' high-school building at Reading, Pa., Mr. George F. Baer, President of the Reading Railroad, made an address which has attracted much attention, in part because Mr. Baer is widely known as the mouthpiece of the coal-carrying railroads at the time of the great anthracite strike two years ago, in part because he voiced a protest against the hysteria that just now possesses the public, and in part because what he did say, though somewhat trite, was very pithily said. Thus, amongst other things, he declared that "progress is safe only when it becomes a development of the accumulated wisdom and experiences of the past." He was speaking of political and social matters at the moment, but we can't help wishing he had been addressing a body of architects and builders who were about to embark on reinforced-concrete undertakings of one variety or another, since his admonition would precisely fit their needs. Substitute "reinforced-concrete" for the word "progress" in the quotation above and we have an apothegm that deserves a place on the office wall of every architect in the country. There is evidence on every side that experiences are accumulating only too fast; we can only hope that we are gathering a little wisdom at the same time.

IT is reported that the Kaiser Wilhelm II. has been discussing with Dr. Böde, curator of the Royal Prussian Museum, the advisability of legislation that shall prevent the sale to foreigners of pictures, sculpture and *objets d'art* now in Germany but not included in any national collection—in other words, the promulgation of a species of "Pacca edict." The suggestion seems rather illogical, for if there is a real purpose behind the many undertakings of the eccentric but hard-working Emperor, it surely is the securing to his people of material wealth computable in marks and pfennigs. If, for the sake of an increase of these, he is willing to allow the Krupp works at Eisen to sell to foreigners armor and arms that some day may be turned against his own subjects, it seems rather unreasonable that he should prevent others of his subjects from turning their canvases, marbles and bric-à-brac also into coin of the realm. With Italy the case is different, for a large part of the income of the Italian people is brought to it annually by the thousands of travelers drawn to the country by the knowledge of the glories of the arts that are to be found in private no less than in public collections, and it is obviously good business policy not to sell out all one's goods, if it is intended to keep on doing business at the old stand.

AVAILABLE STONE FOR THE WASHINGTON CATHEDRAL.

THE announcement made public that the Chapter of the Episcopal Cathedral of St. Peter and St. Paul, in Washington, has chosen Henry Vaughan, of Boston, and George F. Bodley, R.A., of England, to prepare plans for a great Gothic cathedral in the National capital naturally awakens interest in the selection of material for the structure. Little information has been given out as yet, beyond the facts that the cathedral will be one of the most imposing in America, that it will seat nine or ten thousand persons, will be five hundred feet long, will have three towers, will be in pure Gothic style, and will cost several million dollars. This is enough to show, however, that the edifice is likely to be one of the greatest pieces of stonework ever undertaken in this country. From the nature of the structure and the amount of ornamentation that will be called for, the choice of a material of construction assumes a far greater importance than in the case of a commercial building, or even a public edifice, of like size and equal cost. It may be assumed that the architects and the Cathedral Chapter will not finally settle upon any stone or stones without a careful study of every particular that enters into consideration. It is no impertinence and no attempt to forestall their action to discuss at this time the materials that are most available.

The various points that will lead to the selection of any particular stone may be enumerated in this order:

(1) Effect and durability. (2) Cost and economy of working. (3) Sufficiency and convenience of supply. These are all so inter-related, one to the other, that they cannot be considered apart. Such a building as contemplated will call for a great many hundreds of thousands of cubic feet of stone before the final pinnacle is set in place. To supply all of the material would be a severe draft upon any quarry in existence; indeed there are only a few that could venture to undertake it. The demand might even exhaust some entire deposits, where the merchantable stone is of limited amount. Architects have had so many bitter and costly lessons from inadequacy of supply and delay in delivery that it may be taken for granted that no final decision will be had until after the most thorough and careful examination of the stone *in situ*. In a matter of so great moment the examination should be made by a scientific geologist, to report as to geological formation, and by a practical quarryman, as well, the latter to determine as to the possibility of getting out the stone as needed.

It may be well at the outset to consider what is being done, and what has been done in the past, in a few similar instances. At the present moment three great cathedrals are in process of construction in this part of the country. The most notable, because the largest and most elaborate, is St. John the Divine, in New York. The exterior of this is of the light yellow Mohegan granite, quarried in Westchester County, a short distance back of Peekskill. The stone, previous to its selection for this cathedral, had comparatively limited use and had been but a short time on the market. The architects were led to the choice by the fact that this was the only available stone that gave the color-effect desired. The yellow granite is a unique occurrence, so far as known, and the deposit is not of great extent. Most of the available ledges are controlled by the Cathedral Chapter in order that they may be assured of their own supply. It is scarcely possible that a sufficient and rapid output of this stone for another great building could be secured, even if it were desired. For the interior of St. John's, in order to present a harmonious effect, choice was made of the yellow Frontenac limestone from Minnesota. The same conditions obtain here as with the Mohegan granite, complicated by the fact that it is difficult to obtain large blocks. With either of these stones the item of transportation to Washington would have an important bearing.

The new Catholic cathedral in Newark is nearing completion. The exterior of this is of Troy white granite, from New Hampshire. This is a fine-grained granite, of remarkably even texture, presenting what is known as a "pepper-and-salt" appearance, the "salt" being largely preponderant. The deposit is of considerable extent, and there are several quarry openings. Doubtless a sufficiency of this stone could be had, with further development, for another great cathedral, if the long freight haul to Washington did not stand in the way.

The Episcopal Cathedral of All Saints, in Albany, is at a standstill for the time, being far enough along toward completion to permit of full use for the purpose of worship. The walls are of a light red sandstone. Inasmuch as a similar material can be obtained in many parts of the country, there is no need to dwell upon this particular stone. The same is true of St. Patrick's Roman Catholic Cathedral in New York City, built of white marble from Westchester County, and the Roman Catholic Cathedral of the Immaculate Conception, in Albany, built of brownstone. There are many other handsome church edifices in various parts of the country built of the ordinary commercial stones that are in free use in their particular localities.

In olden times the cathedral builders were very much restricted in their choice of material. Unless there was direct water-carriage, stone had to be taken from deposits near at hand. This meant that many stones were used for great edifices that never would have been selected had it been possible to range farther afield; and yet the general result has been highly satisfactory in the main. There is always a particular harmony with its surroundings in a local stone. Besides, when chemical analysis and scientific testing were unknown, the use of any stone far from its natural location would have been purely in the nature of an experiment. In view of the rapid disintegration of much modern stonework, in spite of our advance in exact scientific knowledge, we are led to the conclusion that the ancient architects "builded better than they knew."

Modern systems of transportation will enable those in charge of the Washington cathedral to search for the best material over a large range of territory. Still, the nearness of a deposit to the National capital, other things being equal, will have immense weight in the final determination. The predilection of official Washington for a "white city" had led the Government to specify white marble and granite for public buildings, which are to be grouped, as far as possible. This will probably have no effect whatever upon the choice of stone for the Cathedral, inasmuch as the edifice is to be isolated in its own particular group of buildings. Beautiful as white marble is for structural purposes, it is not generally regarded as the most suitable material in which to interpret a Gothic design. Should the architects and the Cathedral Chapter wish to see their creation wrought in "frosted stonework," there is plenty of white marble available. The nearest supply is in Baltimore County, Maryland. This is a dolomite of medium texture, and is strong and durable. The deposit has been commercially worked nearly a hundred years. The stone was used in the National Capitol, and also in the Washington Monument. One objection that can be urged is that the stone is badly jointed as it lies in its natural bed and shows the effect of torsional movements. Dry seams sometimes reveal themselves in the quarried blocks,—although there is no difficulty in getting out stone suitable for all ordinary building purposes, and a few good-sized columns have been quarried. The Georgia marble fields are not so far away but that plenty of Georgia marble has been used in Washington. The same is true of the Vermont marble. Both of these stones are too well known to need any comment. They are among the few deposits where there would be no question about getting out the vast amount of material needed and making deliveries as rapidly as called for.

Some of the fine old buildings of England are erected of colored marble, like Purbeck. As yet we have nothing of the sort in America, with the exception of one or two buildings, like the Pierpont Morgan Library, where a tinted marble, a pinkish white, has been used. This gives an agreeable warmth of tone; but a material such as this pink Tennessee marble would be altogether too expensive for a mammoth cathedral; but there are deposits of colored marble that have not been used for decorative purposes because of difficulty in polishing or lack of liveliness in color. Many of these would make admirable structural stones. They are sound and durable, and easily quarried and worked. There has been no call for them for commercial buildings, because popular taste to-day generally demands a light and lively stone. But a touch of somberness is permissible in a cathedral and a stone of medium color and some "pattern" might make appeal to the architects. To mention a single deposit that would come within the above category, there is the broad marble belt that runs from the Island of Manhattan, through New York, Connecticut and Massachusetts into Vermont. This is mostly white marble, but at several places, notably in Putnam County, it develops into pronounced colors. These range from brown, through dove to pink. The colors are too closely in harmony to give any streaked effect. A building erected of such a stone would be absolutely unique, as well as undeniably beautiful.

If a light-colored granite should be desired, there is also

considerable latitude in choice. The whitest of the known granites is being used in the new Union Railway Station in Washington. This comes from the neighborhood of Bethel, Vt. The deposit is not very circumscribed, and there are several quarry openings. However, the output is pretty well taken up by existing contracts, and there might well be hesitation in giving out such a tremendous order as the Cathedral would entail. Among the Maine granites there are several fine-grained light stones, such as Hallowell, for instance. Half a dozen Maine quarries are capable of a practically unlimited output, and the stone could go by water transportation direct to Washington. Of the medium-colored and darker granites there are plenty closer at hand. In Howard County, Maryland, there is a dark gray porphyritic granite that has been used with good effect in the Catholic Cathedral at Baltimore. Other deposits of varying color are found in Cecil and Baltimore Counties. It must be said, however, that all of the Maryland granites are badly jointed, and consequently expensive to quarry. The entire belt of Archæan rock has at some time in its history undergone serious disturbance. Virginia also offers excellent gray granites, and the Richmond quarries can point to the State, War and Navy Building in Washington, one of the most elaborate granite structures in America.

Should the Cathedral builders desire to make use of granite, and at the same time seek a novel effect like that secured by the architects of St. John the Divine, they could scarcely do better than to go to North Carolina for their stone. There are unlimited deposits of granite in that State, although the quarrying industry there is only in its infancy. The stone lies in immense sheets, and by the use of water under hydraulic pressure tremendous blocks, sometimes containing more than a superficial acre, are broken out in one operation. Among the North Carolina granites is one of very fine grain and of a delicate pink tint, almost a flesh color. This is one of the strongest of known stones, a Government test showing a crushing strength of about fifty thousand pounds per square inch; and yet it splits with remarkable ease and is not difficult to work. This pink granite occurs at several places. It has not been long before the public and has not yet been used in any building of more than local importance.

It will not be surprising if choice is made of some other material than granite. In a building calling for elaborate ornamentation the cost of working will assume much importance. It is true that the use of pneumatic tools has greatly reduced the expense of cutting granite, but it is only natural in a job of such enormous magnitude that preference should be given to a stone that can be put under the gang-saw and the planing-machine. This does not mean that the choice will be likely to fall on the material that works most easily and cheaply of all, Indiana limestone. The Bedford oölite is one of the most beautiful, satisfactory and useful stones taken from the earth, but it is scarcely conceivable that it would be selected for a building intended to be one of the great monumental edifices of the country. Its widespread use for every variety of commercial structure, even warehouses and manufactories, would naturally preclude this. Even if an oölitic stone were desired, something different from the familiar buff and blue of Indiana is possible. The oölite belt covers a considerable territory, running from Indiana down to Alabama, and reappearing again in Cuba. The Kentucky oölite shows a wider range of color. As to its quality, one can speak in no uncertain tone. Professor George P. Merrill, Curator of the National Museum, perhaps the foremost authority on building-stone, says: "The oölitic limestones of this State are without superiors, if, indeed, they have equals." Some of the stone runs of a very light color, almost white. It has had little beyond a strictly local use, so its employment in the work under consideration would give the much-desired novelty.

If it were deemed desirable to go outside the country, a very beautiful oölite could be obtained from Cuba, in the outskirts of the City of Havana. The stone is found in both buff and blue. It has a finer and more even grain than the Indiana limestone, and the buff presents a very close similarity to the famous Caen stone. I have had samples of it carved, and it responds splendidly to the chisel. It can readily be cut with a penknife, and yet it is remarkably strong, standing repeated heavy blows with a hammer without fracture. Under the Spanish régime the stone was widely used for structural purposes, and an antiquated mill used for many years for sawing it into blocks was destroyed during the insurrection. The deposit is only a mile from the harbor, and with the water transportation it could be laid down in Washington as cheaply as any native stone. During the American occupation the stone was widely used for road-building and concrete construction, and there is a strong possibility that the ledges were shattered by dynamite blasting.

Should a limestone other than an oölite be desired, several admirable stones are available. In Schoharie County, New York, there is a compact crystalline limestone of gray color. This is indistinguishable, at a casual examination, from the celebrated Irish limestone. Like the latter stone, it has the peculiarity of tooling almost white and retaining this tint indefinitely. In Greene County, New York, there is a dense fossiliferous limestone, partly crystalline, of a medium brown color. It would prove rather expensive to work, however, on account of its hardness. Both of these stones are of great strength, of unquestioned soundness, and of excellent weathering qualities. They are also close to water transportation. I have singled these out of many more widely known limestones, not only because they seem specially fitted for work of this order, but also because they have not hitherto found use in important architectural construction.

Mr. Bodley, who is to be associated with Mr. Vaughan in the preparation of the plans for the Washington Cathedral, is also associated with Gilbert F. Scott in the erection of the new cathedral in Liverpool, to be the largest in England. This is to be built of red sandstone, a material found in great abundance in close proximity to Liverpool. Mr. Bodley may, therefore, have a natural predilection for sandstone. In this line we have a bewildering variety to offer, including every known color in which the stone occurs. What is more, despite our unfortunate early experiences with some of the New England brownstones, most of our sandstones weather far better than the English. There are many brownstone deposits not far from Washington, but if this material should be wanted it would well repay the extra cost of carriage to go to the quarries of Pennsylvania or New Jersey. Both of these States have the so-called gray as well as the dark browns, and they are the very best of their class. If the choice should be for a red stone, it should be taken from Massachusetts or Michigan, and, naturally, for a buff or a light gray the architects would go to Ohio. As far as the East is concerned, an absolutely new effect could be obtained by the use of the light pink sandstone found in Pine County, Minnesota, along the Kettle River. This has been used in a few public buildings in the West, but the natural beauty of the stone is soon obscured by the smoke stains of bituminous coal. In the clearer atmosphere of the East it might be expected to retain its freshness. It is extremely delicate in color, showing as nearly a true salmon-pink as one could expect in a stone. The richness of a vast Gothic cathedral, with its delicate tracery and towering pinnacles, wrought in such material can only be imagined.

If only for sentimental, patriotic and business reasons, it might be expected that the Cathedral builders would confine their choice to an American stone. But when it is taken into account that nowhere else in the world are better materials of construction to be found, there would be little to justify going outside of our borders. At one period in our history we drew freely from English and Scotch quarries for our structural stone. The experiment was not a happy one. Our streets are sprinkled with elaborately carved façades that have crumbled to unsightly wrecks under the severity of our climate. Scarcely a single foreign stone has weathered well in America. Candor compels the admission that there is one which has proved its equality with native material. This is the Nova Scotia sandstone. There would be no valid reason for the choice of any of the red Nova Scotia stones, for we can fully match them here. The color-effect given by the olive freestone might appeal to some tastes, but to many it would seem to lack the needed warmth. An argument could be advanced for the cheapness of all-water carriage. Against all claims on behalf of the stone, however, can be raised the argument that most of the quarries have already been worked below the sea level. The slightest touch of salt water, even the dashing of spray over a vessel's deckload of stone, causes an efflorescence that is most objectionable.

Architects have a decided fondness for yellow, and, unfortunately, Nature, so prodigal with her gifts, offers little of this tint. For some reason, too, the yellows that are found are seldom permanent in color on exposure. The limestones and marbles, in particular, are apt to weather to a gray or to a muddy brown. In sandstone the color is generally more inclined toward buff when it is first taken from its bed, but it proves more durable. There are large tracts of undeveloped sandstone all through

the South. I have been shown a sandstone from Richmond County, North Carolina, that could be called without too great a stretch of the imagination a canary yellow. It certainly more nearly approaches that tint than it does a buff. To use a standard comparison, it is as even and uniform in grain and works almost as readily as Caen stone. Similar deposits are reported elsewhere. This is another material that would yield a marvelous effect if it could be employed in a great building of rich ornamentation.

Architects and building-committees have a natural hesitation in selecting a material where no development work has been done. This is generally because the stone is wanted for a commercial or public building where the element of time is a leading consideration. The Washington Cathedral, however, is to be in construction during a long course of years, and more deliberate methods are possible. With an assured market of a million or more cubic feet of stone, whenever a choice is made, railroad and transportation companies would lend all the aid in their power to the work of development.

Few such grand architectural opportunities as this cathedral affords are offered in a century. If those in charge of the work rise to the full level of their duty they will not content themselves with sitting in their offices and calling for samples. They will range far afield in search of the very best material the country affords, whether it be found in quarry banks or deep in the earth. Once it is found, needed enterprise and capital will not be lacking to bring the stone in constant supply to the builders.

FRANCIS W. HOYT.

"ARCHITECTURE AS A BRANCH OF CIVIL ENGINEERING."

THERE is just now so much of a certain veiled hostility between the architect and the engineer, owing to the fact that modern building methods have forced them into a coöperation where the function of each is of such real and indispensable importance that each is inclined to feel and assert that his claim to authorship in the mutual accomplishment is preponderant over the other's, that our readers will find an interest in the enclosed fragment of a discussion that took place at the late annual meeting of the American Society of Civil Engineers, the topic being that perennial one, an amendment to the constitution, worded as follows:

"Strike out Sections 1, 2, and 3 of Article II., present Constitution, and substitute three sections, as follows:

"1. The Corporate Members of this Society shall be designated as Members and Associate Members. Corporate Members shall be Civil Engineers; the profession of Civil Engineering being here defined as including the branches commonly called Civil, Mechanical, Mining, Electrical, Military and Naval Engineering, and embracing Architecture and Naval Architecture. There may also be connected with the Society, Honorary Members, Associates, Juniors, and Fellows, who shall be entitled to all the privileges of the Society except the right to vote and to hold office therein; provided that Honorary Members elected from the Corporate Members of the Society shall retain their right to vote and to hold office."

THE PRESIDENT.—The Section is now open for consideration.

C. C. SCHNEIDER, PAST-PRESIDENT, AM. SOC. C. E.—I would suggest changes in the second sentence, to read as folows: Corporate Members shall be Civil Engineers of all branches of the profession, and embracing Naval and Military Engineering and Naval Architecture.

(Motion duly seconded.)

MR. MARBURG.—Do I understand Mr. Schneider to exclude Architect?

MR. SCHNEIDER.—It was my intention to omit Architects, because, if we left the word "Architect," we would be compelled to admit, as a full Member, any one who calls himself Architect, and who has been in business for five years. Many of those who call themselves Architects, nowadays, are neither architects nor artists, but decorators.

MR. MILLER.—I believe I made that suggestion in the previous Business Meeting; for this reason, that Architecture is one of the fine arts, and Engineering is, as has been suggested, a science, and there are many architects who have reached eminence in their particular line, but who are not qualified as Engineers, and I think ought not to be admitted to any of the grades of membership. They should properly be placed in our grade of Associate.

S. BENT RUSSELL, M. AM. SOC. C. E.—If the motion is in order, I would like to move that it is the sense of the meeting that architects should be placed among the Associates and not among the Corporate Members.

MR. WILLIAMS.—I will support that motion.

WILLIAM C. FURBER, M. AM. SOC. C. E.—I think the Civil Engineers' Society, the American Society of Civil Engineers, are constantly narrowing themselves, so that instead of embracing the whole circle of engineering, they are liable to be railroad engineers and bridge engineers and surveyors. If you look over the field of electrical engineering, you will find that the electrical roads are not being built by the Members of the Society; if you look over the mechanical structures being erected over the country I think you will find that there are many not being erected by members of the American Society of Civil Engineers. I do not think that any of the members who have spoken against including architects would do so if the members realized the extent and the value of the services that the architects perform.

The statement that they are decorators is not true of the great men of that profession. It is not true of the men who designed the monuments of antiquity, the magnets that draw travelers across the ocean. I think it would be a great mistake to exclude the architects from the professional members of the Society.

MR. TRAUTWINE.—It occurs to me that it would be unwise and improper to strike out Architecture as a branch of Civil Engineering, under the definition quoted here this evening. Engineering being the science and art of directing the great sources of power in nature to the use and convenience of man, Architecture is a branch of Civil Engineering. It is the art of decoration in Civil Engineering applied to the construction of buildings. It may very well happen that men who call themselves architects are only decorators of buildings or furnishers of designs for buildings, but it seems to me that that is not a proper excuse for leaving them out as a branch of Civil Engineering, and that it should be the province of the Membership Committee to say whether an architect has been engaged in responsible work or whether he is a mere decorator.

MR. SEAMAN.—I think that if an architect practices in connection with his profession Engineering, he is an Engineer, and as such should be admitted, but merely that he is an architect does not make him an Engineer; and I think that the architect should be excluded from the list of engineers unless he is an engineer himself. It has been said before our Society that the Architect is the Engineer of the world. I think it may be more rightly said to-day that the Engineer is the Architect of the world.

J. WALDO SMITH, M. AM. SOC. C. E.—It seems to me that this matter of architects and naval engineers is taken care of by the present Constitution. An architect applies for membership, and if he has all the qualifications of a Member he is placed in the grade of Member. If he has the qualifications of the Associate he is placed in that grade, and I do not see why the matter is not all right just as it stands.

MR. SWENSSON.—I most heartily agree with Mr. Smith. I think the name "architect" should not be stricken from the classified membership, but that the Board of Direction through its Membership Committee will take care of the matter of classification and put the man where he belongs.

THE PRESIDENT.—Any further discussion of Mr. Russell's motion?

MR. WILLIAMS.—I move to lay this motion on the table.

(Motion seconded.)

THE PRESIDENT.—It is moved that the motion of Mr. Russell be laid upon the table. Those who are in favor of the motion will say "aye;" those opposed, "no."

The motion is carried.

THE ORIGIN OF LANDSCAPE.[1]

NO matter in what direction we turn, under what form of climate, or with what type of geological structure we may choose to begin, the cardinal fact which meets us at the outset, and at every subsequent step of our progress, is the universal decay of the surface of the land. Even where no pains are taken to inquire how this waste is brought about, or what relative share each agent of destruction can claim in the final result, it can readily be perceived that no matter what may be the conditions of climate or exposure, the rocks that come to the light of day are suffering a constant superficial decomposition. The thin crust of disintegrated material formed upon their surface is gradually broken up and washed off by rain or blown away by wind, so as to expose a fresh surface underneath to a repetition of the same process. Every shower that descends upon the land contributes towards the removal of the loosened particles, and the reality and efficacy of this contribution may be seen in the mud which darkens the rivulets and rivers. Though the measurable extent of the denudation displayed by a landscape may be enormous, obviously no extraordinary agent or process need have been con-

[1] Extracts from a paper in the *Edinb Revgh riuew* for October 1906.

cerned in its production. It may well have been effected by the same seemingly feeble powers whereby it is still continued, if only sufficient time be granted for their task. Nor do we need to assume that they must formerly have worked faster than they do now, for it has been shown that even at their present rate of activity a comparatively short geological period would suffice to reduce most of the dry land to the level of the sea. . . .

Apart, however, from the varying rate of denudation, according to the angle of declivity of the ground, and the energy of the agents by which the work of destruction has been carried on, a fundamental source of variety in the topographical results achieved is to be recognized in the diverse characters and powers of resistance of the rocks which come to the surface. It is to this cause that the local distinctions of landscape must be mainly assigned. As the harder materials withstand subaerial decay better than those of softer nature, in the general progress of the lowering of the land-surface they will tend to be left projecting as ridges and hills, while the less durable varieties will be worn down into hollows and plains. Again, among the harder kinds of stone, great differences exist in internal structure, and in the way in which such rocks yield to the attacks of time. Each of them succumbs after its own fashion, and thus contributes its own individual features to the general scenery. In the south of England, for example, "the long backs" of the "blushless downs" mark the successive outcrops of the Chalk. Farther north, through the midland counties, the winding ridges of escarpment, with the level plains between them, show where the hard limestones and the softer clays and shales of the Jurassic series come in alternate bands to the surface. Far to the west, the rugged tors of Devon and Cornwall owe their distinctive forms to the weathering of the granite hills. The high grounds of Wales and the Lake District are built up of ancient massive marine sediments and enduring volcanic rocks, which, with their endless varieties of composition and structure, have been sculptured into the array of picturesque shapes so characteristic of these regions. In the Lowlands of Scotland, the isolated crags, crowned in so many cases with mediæval castles, consist of obdurate eruptive rocks which have outlasted the destruction of the sedimentary strata that once lay piled in thousands of feet above them. In Antrim and among the Western Isles, the terraced hills, with their successive platforms of dark stone and green slopes between, mark the outpourings of the youngest volcanoes of Britain, which, comparatively recent though they be, have been trenched by endless deep and wide glens and long arms of the sea until they have been reduced to a series of scattered outliers on the mainland and detached islands fronting the western coast.

The slow and prolonged process of scultpure, to which the gradual evolution of landscape has been mainly due, was obviously liable from time to time to be variously modified by movements of the earth's crust. These changes were sometimes tranquil, a terrestrial region being gradually pushed above, or let down below, the level of the sea. At other times the movements have been more energetic, and have culminated in the upheaval of long and lofty mountain-chains. Some of the consequences of such disturbances of the crust, whether in the way of elevation or depression, deserve attention from the influence which any change of level would necessarily exert in modifying the progress of denudation. An uplift of the ground tends to heighten the rainfall, to augment the volume and declivity of the rivers, and thus to accelerate the general erosion. If this uprise is long-continued, but interrupted by pauses of some duration, during which the level of the land remains unaltered, the progress of decay will be marked by alternations of periods of more vigorous and more feeble activity. The old river-terraces which form so conspicuous a feature of temperate latitudes both in the Old World and in the New, and which in Western Europe have yielded so many remains of extinct animals and flint-instruments of human workmanship, have been plausibly regarded as memorials of such a series of uplifts, separated by long intervals of rest. In Britain the larger streams commonly display two, not infrequently three or more, well-defined platforms of alluvium above their present channels. There can be no doubt that each of these terraces marks a former level at which the neighboring stream flowed, and that since the highest of them was accumulated, the water has gradually cut its way downward in the bottom of its valley to the level at which it now runs. These river-terraces have never yet been made the subject of a general detailed study, which they well deserve to receive, not for a limited district merely, but for a wide region or a whole country. Whether, or how far, they can be shown to indicate an intermittent uprise of the land, remains for future discovery. It is at least certain that at a comparatively late period some portions of the British Isles underwent an emergence from the sea interrupted by long pauses, each of which is marked along the coast-lines by a platform of marine alluvium or old sea-beach, and some of these beaches undoubtedly merge inland, into true river-terraces. . . .

There can be no doubt that at a comparatively recent geological date Britain stood a good deal higher than it now does, and was united to the Continent by a wide wooded plain, across which the Thames and our other eastern rivers, together with the Rhine, the Elbe, and other Continental streams, flowed towards an Atlantic inlet between Shetland and Scandinavia. On our western coasts the present groups and chains of islands were in great part joined to the mainland, which, with its hills, glens, and lakes, stretched some way westwards, beyond the present limits of the land. Since that time the whole region has subsided. The eastern plain now lies below the shallow North Sea, while on the western coast the tides of the Atlantic flow far up what were formerly glens and straths. So comparatively rapid and so recent has been the subsidence, or so slow the deposit of sediment on the sea-floor, that with the help of the sounding-line it is even yet possible to map out the course of the submerged valleys and lakes, together with the position of the ridges that rise between them. . . .

If we suppose the case of a region in which no movements of the terrestrial crust take place for an indefinite period, but where the progress of denudation is allowed to continue without interruption or modification, we can conceive that the land will gradually be reduced in level and in area until finally it will disappear under the sea. At present, in such a tract of the earth's surface as Western Europe, with much high ground and a copious rainfall, it can easily be shown that the amount of material eaten away from the coasts by the waves and tidal currents of the Atlantic and North Sea is exceedingly small when compared with that which is removed in the same space of time by brooks and rivers from the general surface of the Continent. But in the case supposed, where denudation is allowed to go unchecked by any underground disturbance, the character and rate of the denudation will gradually change in proportion as the land is reduced in level and approaches more and more to the form of a plain. As the rainfall, and with it the volume and erosive power of the streams, will consequently diminish, subaerial erosion will become continually feebler. But no corresponding cause will affect the abrading power of the sea. So that, in the last stages of the disappearance of a land-surface, marine action may equal or surpass in efficacy that of the subaerial agents. The final result of such an undisturbed continuance of denudation will be the production of a plain (the "plain of marine denudation" of A. C. Ramsay), the surface of which may ultimately lie below the downward limit of marine erosion. Reduced to that level, the plain thus formed will be protected from further abrasion by the overlying water, and may remain in this condition for an indefinite time, until some renewed disturbance of the crust shall either depress it, so as to allow it to be buried and preserved under accumulations of marine sediment, or upraise it into land to undergo once more a cycle of denudation.

Whether or not, in the past history of the globe, the crust of the earth from time to time remained long enough undisturbed to allow the process of denudation to reach in this way its ultimate limit over a wide region cannot be positively affirmed, though various districts may be cited as affording a strong presumption that such has been the case. The Scandinavian fjelds for example, consist of a complex series of ancient rocks which have been worn down into the broad table-land already alluded to, on the wider parts of which lie the chief snow-fields. A similar structure may be observed in the Grampian Hills of Scotland, where, at heights of 3,000 feet above the sea, there are spaces large and level enough to be turned into race-courses. But even where the extreme result of denudation has not been reached, there can be little doubt that again and again in the geological past the intervals between great uplifts of the terrestrial crust have been long enough to permit tracts of high ground, sometimes even mountain-chains, to be worn down into undulating lowlands. Traces of such erosion are still to be seen beneath the piles of sedimentary material of which so much of the crust of the earth consists. But had all relics of such ancient land-surfaces been wholly buried under these accumulations, we should only have to contemplate the vast thickness and wide extent of the stratified for-

mations, to be assured of the potent influence which denudation has played throughout the past in the demolition of land and consequently in the evolution of scenery. . . .

In pursuing the details of this history we do not need to conjure up visions of unknown forces of nature, or to indulge in speculations as to ancient convulsions that broke up the surface of the land. The processes concerned in the evolution of our landscapes are familiar operations of nature, and the results which they achieve can be illustrated in examples culled from every quarter of the globe. The truth is thus impressed upon the mind that the detailed features of the land, instead of having been brought about by paroxysms of commotion in the crust of the earth, have been carved in the course of ages by the same everyday agents that are still busy at their task before our eyes.

CURRENT REPARATIONS AT ST. MARK'S.

A WRITER in the *Morning Post* gives some interesting details of the work of preservation now in progress at the basilica of St. Mark.

"At the present moment work is being actively prosecuted in no less than four separate points of the building, while at two others the preparations for repairs are now made. First and most noticeable is the task of making good the fissures that have appeared in the atrio, or vestibule. The part to the right of the main entrance is now entirely closed to the public, and there the engineers have had a difficult problem to solve. The great columns which stand there have been split by the oxidization of the iron clamps inside the base and at the top of each, and it has been necessary to raise the capitals, which fortunately have nothing resting on them, by means of a crane, extract the oxidized iron, replace it with bronze, lift up the whole column for the same operation at its base, and then replace each column and capital in its former place and at its former angle, slightly out of the perpendicular. Two columns have already been treated successfully in this way. In a fortnight's time another pair will be taken in hand. Inside, right up to the roof, there now stands a vast and massive scaffolding, four stories in all, made of American pitch pine, which looks as if it were meant to last forever. The roof was cracked in this part, and the mosaic has consequently been partially removed. Complaints are made in Venice that this operation is frequently misunderstood abroad, and it may therefore be well to describe how it was accomplished. An impression of the mosaic is first made on specially prepared paper—*carta da filtre* as it is technically called—which, being porous, receives an exact impression of each separate piece of mosaic. This paper is then colored with the precise colors of the original, and serves as a pattern. The mosaic is then taken off in strips of about 2 or 3 feet in length and is laid on the wooden floor of the scaffolding in exact order, just as it was on the wall of the basilica. All the mosaics of the Tribune of the Patriarch, for example, which had begun to fall, are now lying in this position. The architects claim that when a wall has been repaired and the mosaic replaced it is impossible to distinguish any difference between that which has never been moved and that which has been temporarily taken off. Certainly an untrained eye finds it impossible to say where the division between the two begins.

"From the vestibule we pass to the above-mentioned Tribune of the Patriarch, now stripped of its splendid dress. Here one of the arches has given way, part of the Byzantine cornice has slipped about an inch, and the circle of the cupola has been so displaced as to be now an ellipse. Emerging through a dark and narrow passage onto the roof, and scrambling over the leads, we find that the men are at work on the central cupola, where more than half of the woodwork and the lead which covered it have to be renewed. At the cupola of the Madonna the mosaics have been already replaced, but the work of strengthening the supports of the cupola is not yet finished. More serious will be the repairs at the corner of Sant' Alipio, which faces the Piazzetta dei Leoni, and which needs drastic overhauling, as its walls are in a bad state. The last item in the present programme is the repair of the dome of the Apocalypse, the plans for which are complete. There is no lack of funds for St. Mark's. The Austrians endowed it with £2,040 a year, and for many years there were large savings out of this income which are now available."

ZODIACAL MOSAICS.

IT happens that at the time Signor Melani's papers on "Artistic Italian Pavements" were appearing in this journal there was being published in the London *Builder* a more extended series of articles on "Mosaic and Marble Inlays" which covered, with greater detail, essentially the same field. One of the *Builder's* readers noting the mention there of the zodiacal mosaics, to which Signor Melani also refers, has been prompted to contribute the following communication on the subject which our own readers may find of value:

SIR—In connection with the valuable articles on "Mosaic, and Marble Inlay" in the last few numbers of your journal, I don't know whether you may consider the subject of the Zodiac in mosaics as worth noticing, but I have not observed all the following examples among those mentioned. The twelve signs make a remarkably handsome pavement pattern either in tesseræ or in marble inlay, though, of course, the reasons for using the Zodiac thus, were not artistic, but rather mystical or astrological. I don't remember coming across any example of a Zodiac in Roman mosiac.

1. In an old mosaic pavement of small white and black stones representing the seven planets, signs of the zodiac, etc., in the Isle of San Giulio, Lake Orta, North Lombardy. IVth or Vth century. Now destroyed. Stuart: *"Sketches of the Riviera and Lake of Orta."* Milan. 1867.

2. In a tessellated pavement in the crypt of San Savino, Piacenza. Xth century. Murray: *"North Italy."*. 1843; p. 379. *"Discrizioni di Monumenti Piacenza"*; and *"Archæologia,"* xliv.

3. Black and white circular zodiac in the pavement of the Baptistery, Florence, by Strozzi, the astrologer, with a motto which can be read either way. XIth century. *"Annales Archéologiques,* xv., 231; *"Archæologia,"* xliv. Murray, 1048; Baedeker, 1200; Cook, 1293, are the dates given.

4. In mosaic on the west doorway of Notre Dame Cathedral, Rheims. XIth century. *"Archæologia,"* xliv., *"Dictionary of Architecture."*

5. In mosaic at Tournus. XIth century. *"Archæologia,"* xliv.

6. In mosaic tablets on the pavement, 12 inches square, Notre Dame, S. Bertin, S. Omer. Almost unique. Greek or early Italian. Perhaps from the East. Shaw: *"Specimens of Tile Pavements."*. Weale: *"Belgium." "Archæologia,"* xxx.; Wallet: *"Description du pavé de S. Omer,"* i., 847; *Builder,* xlii., 787; Rolleston: *"Mazzaroth."*

7. In the pavement of the crypt of S. Gereon, Cologne. Three signs on each side of the altar and six in front. *"Archæologia,"* xliv.; *"Ann. Arch.,"* xvii. XIth century. By Avenarius.

8. In mosaics designed by Raphael, each with one sign. Libra is Venus. 1516. Paper casts are in the V. and A. Museum.

9. In the mosaic pavement before the high altar in Lyons Cathedral. XIVth century. *"Archæologia,"* xlix.; Higgins: *"Anacalypsis,"* i., 69, ii., 57; *"Dict. Arch."*

10. In white marble inlay, along a meridian line, in a chamber beyond the choir in the Capuchin Church, Piazza Barberini, Rome. By Casoni, fl. 1622.

11. Planisphere in a mosaic pavement, with meridian line and signs; in S. Petronius, Bologna. By Cassini, 1655. Morgan: *"Italy,"* ii., 8.

12. Black and white zodiac in a mosaic pavement in San Miniato, near Florence. 1207. *"Ann. Arch.,"* xv., 231; Waring: *"Arts,"* plate xxiv., *"Archæologia,"* xliv.

13. In a circle of very fine Roman mosaic work in the Grand Trianon, Versailles. *Circa* 1810.

14. Very large signs in circles, in the mosaic pavement of the Galliera Umberto, Naples. *Circa* 1890.

15. In the black on white inlay, on the pavement of the Duomo, Milan, along a meridian line.

16. On a table of most delicate mosaic, in the Gallery of the Pitti Palace, Florence.

17. In rosso and giallo inlay, along a meridian, in the pavement of Messina Cathedral. Old and worn.

18. In red Spanish marble inlay on white, along a meridian, in San Nicola, Catania. By Sartorius, 1841.

19. In black, white, and brown, in a mosaic pavement, with the four rivers, hall of the Rigks Museum, The Hague. XIXth century.

20. In the pavement, in black and white inlay, with the months, of the chapel of S. Firmin, in S. Denis. *"Dict. Arch."* Engraved in Lenoir: *"Atlas,"* plate xi.

21. In chocolate and white, in a fine mosaic pavement, with sun and moon, and two Latin versicles from the "Children's Song," in the vestibule of an old Gothic church in Severinskloster, Cologne.

D. J.

BRUNSWICK TO-DAY.

THE stranger is not interested in these shadows of the old Guelph order—these dynastic intrigues in foreign courts. His eyes are caught and fascinated by the antique architecture. Brunswick is the Nuremberg of North Germany. In the old town, encircled with gardens and promenades where once were the defences and moats, there are scores of mediæval houses in brick or timber, with narrow gables, high-peaked tiled roofs and Renaissance façades with Italian motives of ornamentation. These impart a more distinctive character to it than either the high-towered Romanseque churches, half transformed into Gothic, or the modern architecture, exceptionally good as it is. These picturesque guild-halls and merchants' houses did not lose their essential German qualities even when tricked out with Italian richness of style. The paneling may have found its way into museums as examples of old-time craftsmanship and the antique furniture may have been emptied out of the halls and drawing-rooms into curiosity-shops, but the gables and roof lines are as uncompromisingly native as the language of Luther's Bible. There is the same jumble of styles that makes Nuremberg picturesque and delightful. In the market-place are the wings of the Gothic Rathhaus, with open arcades, delicate stone tracery and richly carved beams; the Renaissance Gewandhaus, with its nine tiers of sculpture and ornament, and the Romanesque basilica of St. Martin's, in various stages of transition. In the rambling streets running out of the Südklint, the Kohlmarkt and the Burg Platz there are pure Gothic structures like the Alte Waage and timber Renaissance mansions, with the gables tilted at the ends so as to leave the long side free for artistic embellishment with raised balconies, overlapping stories, carved balustrades and cornices, projecting windows and ornamental shells, fans, schemes of foliage and burlesque relief. Happy is the traveler with an eye for variety of form and fantastic ornament who is free to stroll among these brick guild-halls and timber houses, and to mark the contrasting effects of the mediæval churches! It is a masquerade of many styles without regularity of design or symmetry of treatment, and with all the ornamental motives borrowed from Italy there is always the characteristic German structure.

The new architecture blends so happily with the old brick-and-timber houses that one is reminded of Munich as well as of Nuremberg. There are the Romanesque theatre, the early Gothic town-house, the Renaissance palace with a quadriga above the portal and with the Ducal Museum, the Technical High School and many other modern Italian structures to match it. The old motives are repeated in the new architecture with fine variety, and one does not seem to pass from one age to another in going from one quarter of the town to another. Brunswick, with all its modern additions and outlying suburbs, is a homogeneous city with a unity and dignity of its own, like Munich. Its architects under the Regency, instead of laboring with heavy hands, like those of Berlin and Hanover, have been inspired by reminiscences of German, Gothic and Italian Renaissance in the old quarter and have displayed lightness of touch in ornamenting the new structures designed by them. If there are fewer fountains than in Nuremberg, and not so many museums and Renaissance façades as in Munich, there are spacious promenades and parks ornamented with good statuary, and there is an air of stately elegance and artistic refinement which justifies the conclusion that Germany with its highly organized system of education has become a more cultured as well as a richer nation. One does not have the same impression in other towns, where a mob of mediocrities has apparently taken possession of the art and architecture and driven out the Genius of Decoration. In Brunswick the new artists, like the old craftsmen who worked on the vaulting of the Romanesque churches or among the gables of the timber houses, have understood something of the poetry of their trade.—*"I. N. F." in New York Tribune.*

ILLUSTRATIONS

"NORWOOD HALL," CHESTNUT HILL, PHILADELPHIA, PA. MR. G. T. PEARSON, ARCHITECT, PHILADELPHIA, PA.

GREAT HALL IN SAME HOUSE.

NORTH FRONT: HOUSE OF NORTON WIGGLESWORTH, ESQ., MILTON, MASS. MR. G. H. INGRAHAM, ARCHITECT, BOSTON, MASS.

SOUTH FRONT OF THE SAME.

VERANDA OF THE SAME.

HOUSE OF J. ALLEN TOWNSEND, ESQ., ARDSLEY-ON-HUDSON, N. Y. MESSRS. LUDLOW & VALENTINE, ARCHITECTS, NEW YORK, N. Y.

PORTE COCHÈRE OF THE SAME.

STABLE OF THE SAME.

Additional Illustrations in the International Edition.

PAVILION OF THE NEW ENGINEERING BUILDING: UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA, PA. MESSRS. COPE & STEWARDSON, ARCHITECTS, PHILADELPHIA, PA.

PERGOLA: HOUSE OF F. B. PRATT, ESQ., BROOKLYN, N. Y. MESSRS. BABB, COOK & WILLARD, ARCHITECTS, NEW YORK, N. Y.

Other views of this house may be found in our issue for May 28, 1898.

NOTES AND CLIPPINGS

ELECTRIC FOUNTAINS.—Really the term electrical fountain is a misnomer, for the current is usually employed merely for illumination, and not in forcing up the water from the basin or other form in which the fountain has been designed. This work is generally performed by the ordinary steam or hydraulic pump, where the location of the source of supply is not sufficiently elevated to furnish the requisite pressure. Several American fountains have been constructed, however, where the electric current is utilized for power as well as for producing the light effects. One of the largest and most notable fountains of this class in the United States is located in Willow Grove Park, in the suburbs of Philadelphia. It is designed entirely for amusement purposes, and the various shapes assumed by the water columns at nightfall, reflected as they are in the rays of the varied lights, form a spectacle which attracts thousands. The water required for this fountain aggregates 50,000 gallons every twenty-four hours, and is supplied by one large and one small pump, the larger being actuated by two 50-horsepower motors working on a 500-volt current.—*D. A. Willey, in The Electrical Age.*

CARBONIC ACID AS A CAUSE OF RUST.—In view of the important place given to preservative coatings in the programmes of engineering associations and the divergent views on the cause and prevention of rust, interest attaches to the data presented by Gerald Moody, of the Central Technical College, at a recent meeting of the Chemical Society in London. The accepted theory has been that the presence of oxygen and moisture would always cause rust, and the view of some chemists that carbonic acid played an important part in the reaction has been considered disproved by experiments carried on by Dunstan, Jowett and Goulding. Mr. Moody, as reported by the London *Engineer*, held that minute traces of carbonic acid are sufficient to set up atmospheric corrosion, and he entered upon a series of experiments to justify his opinion. In these experiments extraordinary precautions were taken to exclude the minutest traces of carbonic acid. His plan was to keep a sample of highly polished iron in a few drops of distilled water for prolonged periods and to draw over it a continuous stream of air freed from carbonic acid by passage over caustic potash and soda lime. In some instances three weeks were expended in purging the apparatus of carbonic acid alone before the water was allowed to reach the iron, and for six weeks the pure air passed over the sample. At the end of this time the iron was as bright as when the experiment began. But, on the other hand, when air containing the normal quantity of carbonic acid was drawn over the sample, in six hours the bright surface was tarnished, and in seventy-two hours, during which time about sixteen litres of air passed over it, "the whole surface of the metal was corroded and a considerable quantity of red rust collected." The question presented by these experiments to the manufacturer of preservative coatings is how to exclude or neutralize the action of the carbonic acid carried by the atmosphere or by moisture. Two correspondents of the *Engineer* comment on the above to the effect that there must be moisture to cause rust. One says that the experiment of the late Prof. Grace Calvert, in 1869 to 1871, showed that with dry carbonic acid there was no oxidation, and that the most rapid corrosion took place when the iron was exposed to damp "oxygen and carbonic acid." The other correspondent says that in all cases of rust, water, as well as carbonic acid and oxygen, must be present; that no oxidation can take place without water, though it has not been ascertained how much moisture must be present or the precise part it plays.—*Journal of the Franklin Institute.*

The American Architect and Building News.

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WHEN an architect is called in by a client to aid him in selecting a perfect wall-paper, does he halt him before a dealer's shelves and, pointing to the ends of the paper rolls projecting from one compartment, say: "My dear client, there, just before your eyes, are dozens of admirable patterns, each designed by an artist of the highest repute, all identical in cost and quality; stretch out your hand, pluck any one at random and unexamined, take it home and clothe your naked wall with it, bearing with you my assurance that your justifiable requirements are fully satisfied and—one moment, please—don't forget to pay me ten per cent. for my excellent advice." If it is not right, or professional, or even politic to compel a private client to entrust the satisfying of his æsthetic needs to blind chance, how comes it about that when the great public presents itself as a client there are some architects, who make up in influence perhaps what they lack in numbers, who would have it believed that the public's legitimate demand for perfection will be satisfied unerringly by its making a hit-or-miss "direct selection" from the leaders of the profession? Grant that A, B, C, D and E are architects of high and equal accomplishment; it is none the less certain that the solutions they arrive at of the problem presented by a given programme will not be either identical or greatly similar, but will afford distinct opportunity for choice. It is probable that there will be a great difference in abstract value between the best solution and the worst one; it is certain that each will be superior over the others in some really important point and it is remotely possible that some one of the five architects may have had a real inspiration and chanced on the perfect interpretation. It is the public's right to secure this perfect interpretation, if it can, and it should on each succeeding occasion take every proper means to secure this.

AND there lies the point of the whole matter; the means employed must be the proper ones; and to our mind the most nearly proper means to employ is the "compound" competition [the reader will be good enough to understand that we are obliged to revert to this subject earlier than we foresaw, because of certain communications published in another column], since it provides at one and the same time, as nothing else does, both the possibility of discovering unknown (and unidentifiable) talent and the certainty of profiting by the skill of selected leaders of the profession. Now, just what does "proper means" imply? It implies, first and obviously, the employment at every stage of a competent expert-adviser; it implies, secondly, that in the first competition, the open one,—which is only to discover the unknown men who are to compete with the invited competitors in the second competition—in order that there may be as little waste in cost-expense as possible, the programme shall be simplified, shall not express, that is, the full requirements of the actual building; shall, further, call for the fewest drawings and these rendered at the smallest scale and in the simplest manner; shall call for, that is, a product that to the untrained intelligence of the usual committee-man would appear scandalously cheap; it implies that the three, or more, winners in this open competition shall be selected by the expert-adviser absolutely on his own responsibility.

FOR the second stage, where the three, or more, winners in the first competition are to compete with an equal number selected from the list of leading architects, "proper means" implies, first, that each of the six, or more, competitors is to be paid a fairly adequate honorarium; secondly, that the successful design is to be selected by the properly authorized building-committee, acting with and by the advice of the expert-adviser; thirdly, that the execution of the building is to be entrusted to the winner at the established rate of compensation. It implies, further, a new programme, more complete and detailed in its requirements and the submission of drawings which, while still as limited in number and scale as circumstances may admit, can convey to the intelligence of the lay jurors clearer information than could the simpler drawings in the earlier competition. It implies, finally, an understanding on the part of the public, through its appointed officials, that the best solution, the one which it is the public's unquestionable right to secure, can only be attained with reasonable certainty by dealing fairly and generously with those who alone are competent to provide it.

TO recapitulate: the "compound" competition gives, so far as we are able to perceive, the only reasonably certain means of discovering economically the best solution which any architect, anywhere, is able to provide, and this is a matter of great consequence, for it is not satisfactory that the public shall by direct selection be furnished with a building that is "good enough" or

Entered at the Post-Office at New York as second-class matter.

which "will do," when by a different procedure it can secure the best which circumstances admit. In the next place the skeleton requirements of the open competition impose on the contestants a minimum of expenditure, while the cost imposed on those who have the luck to take part in the second competition is somewhat less than the cost has been hitherto in the ordinary "limited" competition. There are, however, two disadantages: the public will be subjected to a little more delay and have to incur a little more expense than if the architect for its building were directly selected; but these are not very material defects, when the public is building for all time and when, as is common now with public buildings, the bonds issued to pay for it have to be taken up by the next generation. The second disadvantage is that the system proposed would debar the public from having benefit from the skill of those architects who are principled against entering a competition on any terms; but there are very few such architects, and few of these are leaders. Moreover, it may be accepted as certain that these few will abjure their principles, as soon as it becomes certain that they can erect a public building only after they have won in competition the right to do so: this once understood, they will gladly become competitors—if they chance to be invited.

WE are asked to "comment indulgently" on the price that will have to be paid by those members of the American Institute of Architects who attend the banquet at the coming semi-centennial celebration in Washington, which is to be made memorable by the bestowal of a gold medal on Sir Aston Webb. Without debating the question whether a man who spends fifteen dollars on a meal is indulging or overindulging, we will point out that if "banquets" are to be the rule the Institute will soon cease to be a democratic body, simply because it has become an oligarchical one, for only those who can afford to waste money needlessly will find themselves attracted to these occasions, and money is not always the equivalent of worth. Members who, because they are not elected delegates, have to pay their own expenses are already feeling themselves alienated and discriminated against, and it seems unwise to foster this feeling. Moreover, it is questionable how far the exchequers of the several Chapters may be drawn on at the whim of the Institute's chance committees who are charged with preparing and carrying out the programme of "entertainment." For example, the Boston Society of Architects finds it a rather heavy draft to meet the expenses of the score of men it sends to the conventions as delegates, and those of its members who have to stay at home will hardly relish the withdrawing from the treasury of three hundred dollars more for a single meal, when there are so many other more desirable uses that could be made of the money. On the whole there seems to be a certain likeness between the proposed banquet and a certain notorious insurance dinner given to a French ambassador and "charged to advertising."

SIR ASTON WEBB, in seconding the motion of thanks offered Mr. Collcutt at the close of his annual address, to which we referred recently, took occasion to say that there was "no sadder occupation than to sit on the Council of the Architects' Benevolent Society and hear of so many who have gone under in the struggle for a living in architecture." Of course, as the guest of honor at Washington, he cannot suggest to his hosts that the sum spent on the banquet before him would have been more worthily employed if applied to establishing a fund for the relief of indigent and decayed architects. But we will make the intimation in his place, as we have frequently urged that one of the crying needs of the time was just such a relief fund. Even the painters and sculptors, a fraternity much less closely knit together than the architects, have their Artists' Aid Society which last week listened to and relieved not less than six aged and infirm members of their professions. Two of these men were over seventy years of age, and for that reason infirm, while the others were in need of help because of illness. This Artists' Aid Society and the Artists' Fund Society are trying now to raise a fund of fifty thousand dollars, that a home for superannuated artists may be bought and endowed. The Architects' Benevolent Society, in England, receives annual subscriptions from some four hundred architects, while the American Institute of Architects—banquets!

ANOTHER chapter in the history of the notorious "Westminster Chambers case" closed last week, when the second trial, in the Superior Court, to determine the amount of the damages which the city of Boston must pay the owners of the building, because the State had passed a law depriving them of their right of property in the circumambient air above a fixed height, resulted in a verdict more favorable to the city than was the first one. The sum now awarded by this second verdict ($340,336.99) is less by $141,633.49 than that awarded at the first trial. The plaintiffs were willing to accept the first award, but it is doubtful whether they will accept the second one, and, as they are "good fighters," the case in a new form may once more be brought before the Supreme Court of the United States.

THE New York newspapers are so much given to making good-natured fun of Boston and New England that it is a pleasure, now and then, to find one of them taking serious note of the real needs of that portion of the country, as the New York *Times* does when it says: "Like the Sibylline books, the half of the White Mountain forests are already destroyed. By their conservation of water-power they hold the manufacturing destinies of New England. Shall the Fifty-ninth Congress in its closing session refuse the purchase price of these reserves, and of the Southern Appalachian reservation, and lose for all time their stored-up wealth of energy? Has Speaker Cannon been properly apprised of the wisdom of acquiring these National Eastern forests before it shall be too late?" The matter is one of such serious import that every one who prefers a live tree to a "yellow" newspaper, a perennially full stream to an occasional spring freshet, a wood-fire to a gas-log, a prosperous industrial community to a deserted village or an abandoned farm should help to keep it in agitation.

THE SANITARY FEATURES OF MARKETS AND ABATTOIRS.—I.

IN the following I propose to discuss briefly the buildings devoted to the provision of healthful food-supplies for the large cities, in particular their interior planning and construction, their mechanical equipment and the sanitary arrangements required for them. Prominent among such buildings are the *city markets* and the *abattoirs*. Both kinds of structures require the solution of interesting and often intricate architectural, engineering, sanitary and economical problems.

In general, the term "market" is applied to public places or squares in cities and towns where meetings are held or where crowds congregate for the purpose of buying and selling articles of food supply. In a restricted sense it is used to designate the buildings intended for the sale and purchase, at certain hours daily, of food products. The city markets, as we shall see later on, are usually built by the municipality.

The abattoirs or public slaughter-houses are buildings and places intended for the slaughter of domestic animals, and for the dressing, packing and shipping of the meat. In some cases these buildings are municipal buildings, particularly so in Europe, but in the United States they are largely built by private enterprise.

The food supplies of a city comprise:

(a) Vegetables, fruit and other products of the soil and plant life.

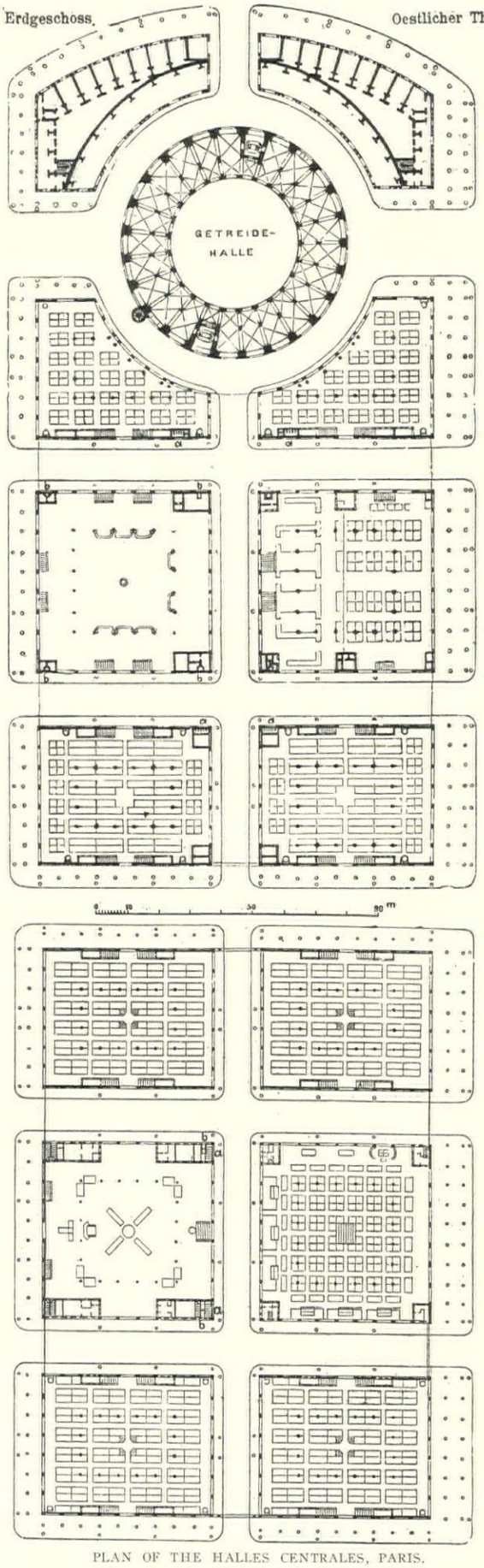
(b) Animal food, such as meat, game, poultry, fish, eggs, milk, butter and cheese.

All food kept exposed for sale in the markets should be pure, fresh and wholesome, and its sale should not cause or create unsanitary conditions. Some food rots quickly if exposed to rain or snow; other food is very sensitive to heat or cold. Decayed fruit, rotten vegetables, spoiled or tainted meat should be at once condemned and removed. The larger the city, the more complex, difficult and troublesome become these problems of food supply and food control.

Markets for the sale of provisions were known to some of the nations of ancient history. The Greeks, for instance, made use of open market squares, called "agoras," which they often surrounded with two-story arcades. The Romans had oblong markets called "forums," with wide porticos. The market-squares were sometimes richly adorned with the statues of famous citizens, with sculptural monuments and with fountains. Later on markets began to be roofed over, but were kept freely open on the sides, as, for instance, in Italy. During the Middle Ages public fairs were periodically held in the open squares or market-places of many cities, some being devoted to only one class of goods, others offering to the buyers facilities for the purchase or exchange of many different kinds of merchandise or commodities. They were generally combined with church or guild festivals, at which a large gathering of people who often came from long distances took place. Later on retail stores were opened in cities on business streets or main thoroughfares, and these somewhat relieved the crowded condition of the city markets.

At the beginning of the present century market buildings became confined to the sale of food supplies and provisions; in deference to practical considerations they were gradually replaced by covered structures. In Paris the Emperor Napoleon I was the first to establish such public markets. The erection of the famous "Halles Centrales" was commenced under his reign in the year 1811, but they were not entirely completed until 1878. They embrace ten large buildings, covering a total of 44,000 square metres, or about eleven acres; their total cost was about ten million dollars, the annual running expenses two hundred thousand dollars, while the yearly revenue to the city amounted, a few years ago, to from one and one-half million to two and one-fourth million dollars.

London, Berlin and other large capitals of Europe followed very soon in the erection of imposing and permanent structures similar to those of Paris. At the end of the nineteenth century Berlin had fifteen large markets, where all food was controlled by sanitary inspectors, and where all meat sold at retail was examined and marked. London had four large markets and Vienna had eight such buildings. In the United States many cities have public market buildings. As examples might be mentioned the Fulton, the Gansevoort and the Washington markets in New York City; the Wallabout market in Brooklyn; the Faneuil-Hall market in Boston, and others. None of these, however, can be compared in size or magnitude of the structural work with the grand structures to be found in some of the cities of Europe. It is related that there was a public market in the city of Boston as early as

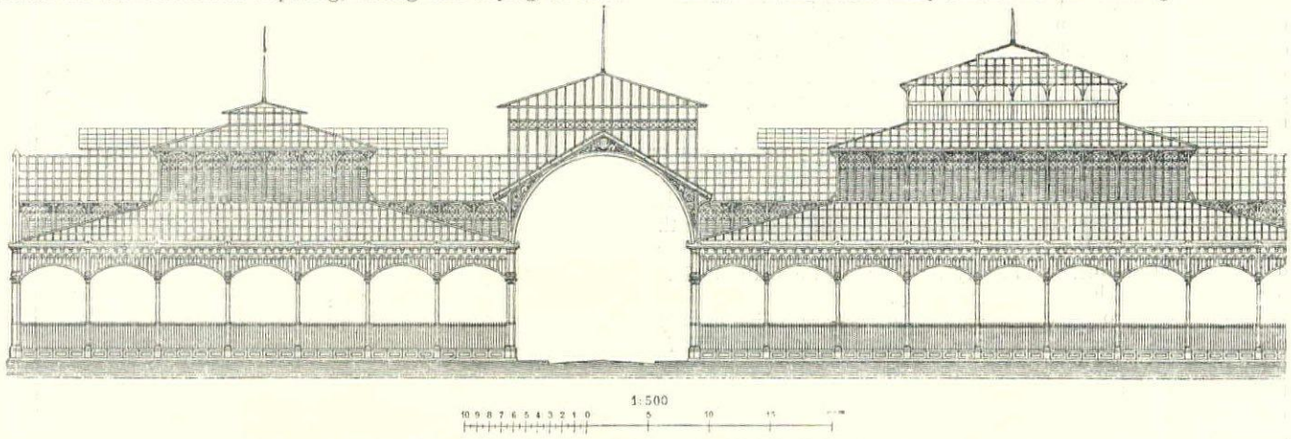


PLAN OF THE HALLES CENTRALES, PARIS.

the year 1634, and a hundred years later we find the city had three markets. In 1834 the city of Boston built the large Faneuil-

Hall market, which cost upward of $150,000 and contained 160 stalls to be rented. This building is at present in charge of one superintendent, under whom 1,400 men work.

Market buildings are utilitarian and sanitary structures, intended for the convenient exposing, selling and buying of food.

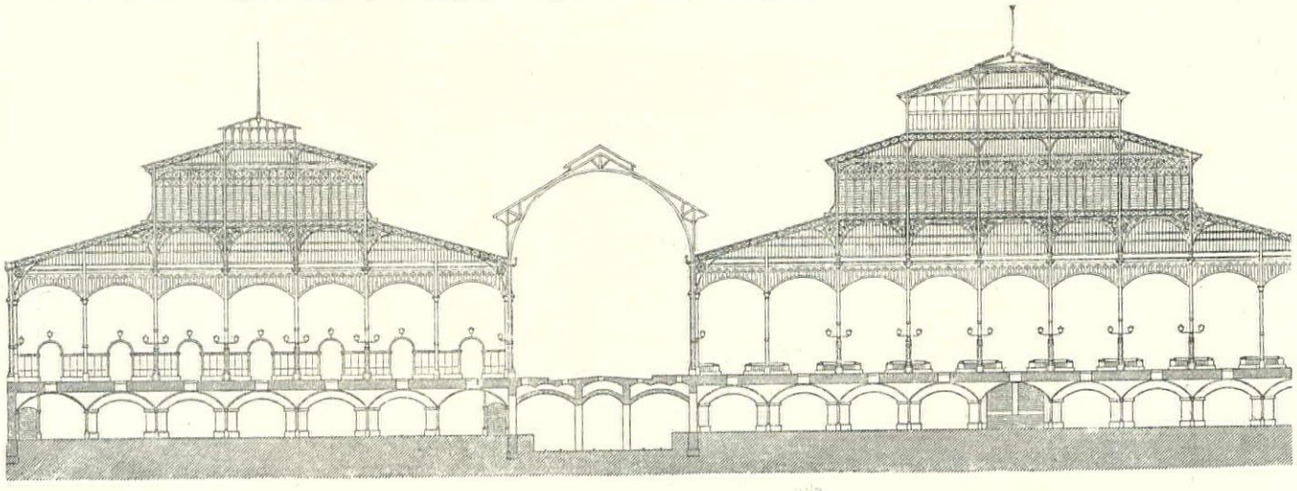


PARTIAL ELEVATION OF THE HALLES CENTRALES, PARIS.

The chief advantages of covered markets are: the buyers and sellers, the market people and the public are protected against the inclemencies of the weather, while the provisions are not so liable to be damaged or entirely spoiled by rain, snow, heat, cold, or by the street dust, by dirt and smoke, and they can be better exhibited and exposed for inspection and for sale. The buyers are offered a greater choice of food supplies, they can obtain fresh food products daily, the buying and selling is rendered more convenient and the prices of provisions become better regulated, more uniform, and in a great many cases cheaper, owing to the reduction in the rent and of the running expenses. City markets also facilitate the thorough supervision and render more efficient the inspection of the food supply by the sanitary police, whose chief duty is to prevent the sale of diseased or decayed meat or other food. Under official supervision the waste materials are promptly removed, and are therefore not so liable to become a nuisance to sight and smell or a danger to public health in populous localities. Covered market buildings also afford improved facilities for the storage of those food products which remain unsold at the close of the day. The soiling of streets and squares unavoidable where these are used as open markets is done away with entirely and the street traffic and the safety of pedestrians are better maintained. Moreover, public market buildings constitute, if properly managed, a source of considerable revenue to the city.

The location of city market buildings depends to some extent upon their character. Large cities in Europe have not only wholesale, but also retail markets, the former being located conveniently near to the traffic and shipping facilities, to the railroads, to river or canal transportation, to the harbor wharves and docks, or to the main roads or highways leading from the surrounding country districts into the city. Retail markets, on the other hand, are located in or near the centers of the most populous city districts, where they can be conveniently and quickly reached by the public and the small trades people. In populous cities, therefore, a large number of well-appointed market buildings are desirable.

In the United States many of the market buildings are devoted not only to the wholesale, but also to the retail trade; the large buyers, such as the chefs or stewards of hotels, restaurants, institutions, steamship lines, the intermediate purchasers or jobbers for the grocery establishments, the provision stores, and the smaller private markets buy their stock of provisions in the early morning hours; later on the retail purchasers come to the market, among them the housekeepers, boarding-house keepers and many women who prefer to make personal selections at the market and who are anxious to obtain their supplies in a thoroughly fresh condition.



PARTIAL SECTION THROUGH THE HALLES CENTRALES, PARIS.

Markets for cattle to be sold for slaughtering are generally located close to, or in connection with, the slaughtering establishments, and are usually termed "stockyards." Special markets, such as fish and oyster markets, are located convenient to the harbor or the docks; markets for the sale of flowers are sometimes held in the early morning hours on the city squares, as, for example, the flower-market in Union Square in New York City.

WILLIAM PAUL GERHARD.

(To be continued.)

EVOLUTION OF REINFORCED-CONCRETE IN GERMANY.[1]

THE first opportunity which the German general public had of becoming acquainted with large structures of concrete and iron was at the Paris Exhibition of 1867, in the exhibits of Joseph Monier and François Coignet, although a boat of concrete with inserted iron rods was shown by Lambot in the first Paris Exhibition of 1855. After the Exhibition of 1867 it was Monier whose name, as far as Germany was concerned, became identified with the new mode of construction, namely, that of the combination of two materials, cement and steel, of

[1] A paper by O. Kohlmorgen, Government Surveyor, Berlin, published in "Concrete and Constructional Engineering" for November.

which one, the cement, could resist great compressive stresses, and the other, steel, great tensile stresses. The term "Monier system," was for many years alone expressive of this form of construction. Only when several systems had arisen were the more accurate general names of "*Eisenbetonbau*" or "*Betoneisenbau*" introduced into Germany.

The true nature of the new mode of construction was not recognized until consulting and practical engineers made a thorough study of it. Constructions of wood and iron, in which the relatively great resistance of the one material to compression and of the other to tension were utilized as far as possible, were already known in Germany—for instance, Howe's beams—but it was in reinforced-concrete that it was first found possible to combine two different materials in the way most advantageous statically, the one material, iron, being embedded in the other, concrete.

In Germany, the invention was first commercially appreciated by the firm of Freytag & Heidschuch, of Neustadt-a-H., and the firm of Martenstein & Tosseau, Offenbach-a-M. In 1884 they acquired from Monier the patents for South Germany, and the right of preëmption for the remainder of Germany. The civil engineer and contractor, G. Wayss, then entered the field. After he had bought the Monier patents for Germany from the above-named firms in 1885, he instituted, in conjunction with them, extensive experiments with structural members of reinforced concrete, paying attention not only to the load-carrying capacity, but also to the resistance to fire and to the behavior of iron in concrete as regards corrosion. In this way he aroused the interest of the public authorities and building owners generally.

VIEW ACROSS THE HUDSON FROM THE LOGGIA OF T. HUNT, ESQ., TIVOLI-ON-HUDSON, N. Y.

The results of these experiments were published in 1887 in a book entitled "The Monier System (Iron Skeleton with Concrete Filling) in Its Application to Building." (Berlin, A. Seydel & Co.) Of the greatest value to engineers were the theoretical arguments at about that time presented by M. Koenen, now director of the Concrete and Monier Construction Company, Berlin, for they served as a basis for the simple calculation of the strength of panels, floors, vaults, cylindrical pipes and free-standing water reservoirs. These arguments were first published in the *Centralblatt der Bauverwaltung* in 1886.

Although this method of calculation, which was then in agreement with the loading experiments, has been superseded by later investigations, it nevertheless gave the new mode of construction a scientific foundation, and made the determination of dimensions in reinforced-concrete work possible. When these rules did not suffice, loading tests were made, and are even now prescribed by the building authorities in difficult cases.

Koenen's theory took no account of the influence of the difference of elasticity between iron and concrete on the position of the neutral axis, but assumed this to lie at one-half of the height, as in the case of a homogeneous section. The values found by the formulas are, therefore, compared with the modern methods of calculation, too favorable, the cross-section of the iron and concrete comes out smaller than by the later theory, since according to modern views the neutral axis only lies at the half-height of the section when the permissible stress in the concrete is $1/n$th part of that in the iron, where n is the ratio of the elasticity of the concrete to that of the iron. For the usual value of $n = 15$, the axis lies at the half-height when the stress in the concrete is $O_b = 80$ kg./cm.^{2} or 1,130 lb. per square inch. The concrete must then have, according to the usual specifications, a compressive strength of $5 \times 80 = 400$ kg./cm.^{2} or about 5,600 lb. per square inch.

The new theory was taken into account by Koenen in his work "*Outlines of the Statical Calculation of Concrete and Reinforced-Concrete Constructions.*"

Of great influence on the arrangement of the reinforcement is the consideration of the adhesion between iron and concrete, and the different systems of reinforced-concete construction differ mainly in the way in which the adhesive stresses are taken up by the concrete and the iron. Even a general comparison of the arrangement of the reinforcement in different countries shows that in Germany the method of increasing the adhesion between iron and concrete by the use of indented bars ("*Wulsteisen*") is not employed. Such bars are much used in America, but some authorities argue that they defeat the object aimed at, since, on account of the varying section of the iron and the consequently varying elongation and contraction, the concrete is sheared off from these expansions. Stress is therefore laid by prominent German investigators on giving each reinforcing rod a constant section. They consider that only in this way is it assured that the adhesive stresses at the surface of the metal are in accordance with the statical laws. But this point is, of course, still very much of a controversial character. Many English authorities of high standing, for instance, favor indented bars in a very marked manner.

The need of practical methods of calculation led the firm of Wayss and Freytag to entrust their former chief engineer, E. Moersch, now professor at the Zürich Polytechnic, with the production of a comprehensive review of reinforced-concrete construction as a whole. So the first edition of "*Reinforced-Concrete Construction, Its Theory and Application,*" appeared in 1903 and the second in 1906.

In 1904 appeared the "Preliminary Rules for the Design, Execution and Testing of Reinforced-Concrete Structures," drawn up by the Union of German Associations of Architects and Engineers and the German Concrete Association. These rules give an appropriate treatment of the considerations which enter into the practical construction of reinforced-concrete, and led the Prussian Government to issue, on April 16, 1904, the "Regulations

for the Execution of Reinforced-Concrete Work in Buildings," in accordance with which the examination by the building authority must take place. In consideration of the rapid progress of scientific investigation, the officials were instructed to report to the Ministry of Public Works their experience in the application of the rules during the first two years. We may, therefore, expect interesting and important communications with reference to reinforced-concrete in a short time from the practical experience gained by the officials.

The "Rules for the Design, Execution and Testing of Rammed Concrete Structures," drawn up by the German Concrete Association (Berlin, 1905) and the "German Standards for the Uniform Specification and Testing of Portland Cement," should also be mentioned.

Since the careful requisitions of the German building authorities have been satisfied by the extensive precautions taken, reinforced-concrete construction has made great progress in Germany, and at present there is hardly any kind of structure which has not been, more or less, successfully executed in reinforced-concrete.

Reinforced-concrete construction has not only given a great impetus to the cement industry and to the manufacture of round and square bar iron, but has brought into existence new categories of workmen. The price of gravel and sand has also increased. A few prices from the Berlin market may be of interest. Portland cement has risen since 1905 from 37 M. per cubic metre to 41 M., delivered, corresponding with 2.64 M. and 2.93 M. respectively per 100 kg., or 4.50 M. and 5.00 M. per normal cask of 170 kg. net weight. Converted into English units this gives 27s. and 30s. respectively per ton of 20 cwt. Pit gravel costs about 5.50 M. delivered, dredged ballast 6.00 M. Reinforcing iron costs 15 M. per 100 kg. The special workmen engaged in reinforced-concrete work in Greater Berlin, that is, the city of Berlin and its 42 suburbs, receive 6.00 Mk. per working day of eight hours.[1]

The efforts of modern constructors in Germany are directed mainly towards making the building as permanent as possible, since in Germany, where until the introduction of the new Civil Code on January 1, 1900, no system of ground rents existed, and the English system of leasing sites for building purposes is unknown, each proprietor aims at making his house as durable as possible, so that he and his successors or assigns may enjoy its use for the longest possible time.

It is in fact with the object of advocating sound construction and the substantiality of buildings generally that the Building Association was founded in Berlin under the leadership of Herr Jaffé, the well-known Prussian Government Surveyor. This society has specially set itself the task of promoting reinforced-concrete construction, steel-and-concrete buildings, etc.

Yet the development of reinforced-concrete construction is far from having reached its limit. Only long experience can show which types will survive, since not only the load-carrying power, but also many other qualities, which it is impossible to express in detail, are of importance in judging the value of a method of building construction.

[1]Mk. = Marks = approximating 1 s.; 20 marks = £1.

COMMUNICATIONS

LICENSED BUILDING SUPERINTENDENTS.

To the Editors of The American Architect:

Dear Sirs:—The International Society of State and Municipal Building Commissioners gladly subscribes to the *American Architect's* contention that "incombustible buildings *must* be built," and that city building regulations should tolerate nothing less. It would seem, too, that while making these laws prohibitive of anything else people might well be coaxed into complying with them in spirit as well as letter, as has also been suggested in the columns of the same journal, by so graduating the taxes that people would pay the minimum rate on good buildings and the maximum on old and firetrap construction, for the protection of which so many municipal expenses are incurred. But with more rigid laws and, of course, the increased anxiety of unprincipled builders to evade them, the inspection of buildings becomes still more difficult. Few cities have adequate appropriations or enough employés for such work under existing conditions, and it is doubtful, even if more onerous duties are assigned the building departments, if much increase of appropriation or forces would be made in many of our most important cities.

A plan suggests itself, however, that would seem to offer a solution of the problem, a way out of the difficulty.

We are familiar with the special police who guard the welfare of the traveling public in railway stations, who protect the property of great private corporations, and who are found in a dozen institutions about a city, men who are employed by those private corporations and paid by them, but are subject to the regulations and wear the uniform of the regular city police.

Why not do something on that same order in our buildings?

The building superintendent [clerk-of-the-works] is the one who comes in closest relation with everything done about the special structure over which he presides. He lives with it, knows its every detail, and is held responsible for it all by the owner.

Now, then, insist that every building superintendent in a city pass an examination before a competent board and be licensed and sworn as a special officer of the city's Building Department. Make it so that no building can be erected without a licensed superintendent in charge.

Let these men be graded and their salaries fixed (at least their minimum compensation) according to whether they are eligible to superintend a first-class building or only minor grades down to the most ordinary construction outside of established fire-limits. Owners would, of course, have the privilege of selecting the superintendents they desire, but only within the classes assigned the buildings they propose erecting. The owner would pay such superintendent's salary, but the latter would nevertheless remain a city officer, and his first duty would be to see that nothing was done on that building that in any way infringed the spirit as well as the letter of the building regulations. The Building Department proper would then simply have to watch the superintendents.

If any one of these, through carelessness or through connivance with unprincipled contractors, or a misplaced zeal on behalf of what might seem his employer's interest, permitted anything wrong to go on he would be derelict to his sworn duty and his license should at once be revoked, and he should be barred for a certain length of time from taking a new examination or should be made to atone in some strenuous manner for his fall from grace.

Nothing, I submit, would contribute more, would conduce so much, to good construction, to the elimination of the shoddy, as would this one move on the part of our municipalities. It would assuredly be a very long step toward a goal that is well worth striving for, but that is most difficult of attainment—perfect, incombustible, uncollapsible buildings. It would at least be well in line with our adopted exhortation or motto: "A city's safety depends upon its buildings—their resistance to time and the elements. People will only build as well as they are compelled to; wise laws and their unwavering enforcement are therefore all-important."

F. W. Fitzpatrick.

THE "COMPOUND" COMPETITION.

December 4, 1906.

To the Editors of The American Architect:

Dear Sirs:—As practically all of your editorial remarks in your issue of December 1 are devoted to a plea in favor of the "compound" architectural competition, especially in relation to public buildings, you will perhaps permit me to say a few words in opposition.

The main argument in favor of such competitions is well stated in your editorial in the following words: The public has a "right to secure with the public funds in the most certain way the best result that can be evolved by any architect, anywhere, willing to attempt the solution of the problem."

In making this argument the advocates of this view make the assumption that the successful competitor in such a competition will be able to produce an artistic and practical and economical building. That is, they assume that the excellence of designs made in projection at a small scale gives assurance that the architect who signs the drawings will be able to execute them in a manner that will be artistically creditable. They assume that the quality of the tools of the architect's trade is indicative of the results to be attained by the use of these tools.

I believe, however, that anyone who but for a moment considers this subject with care will, upon general principles, agree that this assumption is entirely unwarranted, and will, upon further consideration, agree also that the invalidity of the assumption is proved by the inferior quality of the great majority of modern buildings where designs are determined upon by reference to sketches only and without due recognition of the previous accomplishments of the designer; this being true, not only where the designer is chosen in competition, but also where he is directly selected without competition.

It may be held that this difficulty, so far as our important build-

ings are concerned, would be in large measure overcome if the best-equipped men in the profession would agree to enter such compound competitions as you favor; but it appears to me that no man of experience can well defend this claim in the face of the fact that the artistic skill of the practitioner is in no adequate measure determinable by the sketches furnished in such competitions, the practitioner of ability being unable thus to indicate his special capacity, which is disclosed only in the actual preparation of working drawings and direction of the construction. In fact, if he is a man of broad experience he finds himself unwilling to incorporate in such sketches attractive features which he believes to be impracticable, which, on the other hand, the inexperienced designer does not hesitate to suggest.

Beyond this there is no reason to believe that any large number of men of the highest artistic attainments and of wide experience can ever be induced to enter such competitions. They are recognized by all to be gambling operations in which the stakes are high and the chances of winning small; and thoughtful men are wont nowadays to avoid gambling altogether, and especially where the conditions are such as have just been stated.

But even if we assume that men of high artistic quality and professional experience agree as a body that it is quite permissible for the architect to live the life of the professional gambler, it is impossible to believe that they as individuals, who are earnestly attempting to deal with projects in which their artistic ability and skill is certain to tell, will persistently risk their hard-earned savings, and will be ready to employ their laborious thought upon problems which are not certain to be executed by them.

In our day we find ourselves deploring the inferior quality of the mass of the important buildings constructed in England and America; but no one who is acquainted with the smaller private buildings in either country can fail to agree that we and our cousins across the water have in our midst men of the highest architectural ability who would be able to give us the most distinguished mounmental structures if they were allowed to carry them out as they actually do carry out their smaller work in their private practice.

I am perfectly willing to grant that many practitioners who are commonly placed among the "leading architects" are men of inferior artistic ability; but I think it may well be claimed that the men of this type have gained their positions because the public has not yet been taught by the architects themselves that artistic accomplishment alone should warrant professional esteem. Beyond this, it is clear that many men of this type have gained their prominence before the public only because they have been able to win competitions for large and striking buildings which would have been much better designed by other men who refuse to gamble, and who are content to devote their lives to such truly artistic work as comes naturally into their hands.

But, after all, the interest I have in this question, and the interest we all should have, relates to the future development of the Art of Architecture, and this interest leads me often to ask whether we have any reason to hope that we can make any advance in our Art so long as the designers of our notable buildings are necessarily determined by competitions which in their very nature on the one hand encourage the gambler, the man who will exert "pulls," and the inexperienced clever draughtsman; while on the other hand they discourage, if they do not exclude, as they practically do, the men of highest artistic capacity and experience, whose deepest concern is not reputation, nor money-making, but devotion to the interests of their clients and to their Art.

I find myself convinced that this question must be answered in the negative, and I therefore feel it my duty to do all that I can do in my small way to oppose architectural competitions in general, but especially the so-called "Compound Competition"; although I am willing to grant that we may condone the strictly limited and paid competition until such time as our public officials have been so educated by the architects themselves that they will feel the same sense of responsibility in regard to the appointment of architects for public buildings that they now feel in regard to the appointment of lawyers for high judicial positions.

The public, I believe you will agree, have a right to demand in the designing of their monumental buildings the services of men who have proved by their work that they are highly capable artists and able men of affairs, and in my view it is the duty of every architect to attempt to press this view upon the public attention.

But I firmly believe that to insure such results we must necessarily urge the public to employ only men whose artistic ability has received the indorsement of their fellows. For the time being this may occasionally result in the choice of designers who are held to have "arrived" but who are not men of high artistic ability. But in the end it will lead to the encouragement of the men of real talent, for only thus will it appear that professional success is to be gained as the outcome of results achieved; only thus will the artist architect be inspired by the thought that he is to be judged by his works, and that for well-executed constructions he will receive the reward of public recognition.

Yours very respectfully,

HENRY RUTGERS MARSHALL.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs:—I have read with interest your comments about competitions in *The American Architect* of December 1.

Why not make as the test for all competitions the words you have written: "Every one knows that the important element of a design is the germinal conception"?

How often have I thrown down programmes of competition in which I should like to have engaged in disgust at the numerous and elaborate drawings called for—when the total unpaid cost of those drawings must exceed for the losing architects the commission which the winning architect would earn. The "germinal conception" can always be expressed in about three drawings—namely, two principal floor plans and one perspective study. Prof. Ware began to show the right system when he called for pencil-work only, on tracing-paper; but in open competitions where the number of competitors would be legion he seemed never to get rid of the idea that there must be four elevations, two sections, and a plan of every floor even to the unimportant and naturally sequent basement and roof.

There is only one solution to the competition problem, and that is the common-sense solution of asking the army of architects to give only leading ideas and only three or four drawings each to illustrate the "germinal conception"—. A preliminary competition of only two drawings for each competitor (on bristol-board in lead-pencil so that we can render clean, neat, and sharply-defined work) is enough for an intelligent choice of five paid architects for a more detailed competition to follow. Architects must *themselves* put a proper value on their time and labor. In thirty years' experience I have noted a steady increase in the labors and losses of architects in their competitions and an increase in burden of the terms, showing that the public values our work exactly as we value it ourselves.

The abbreviated competition is certainly the remedy for us, and would turn out most successful, as I believe, for the public, in yielding better designs. Yours. A. B. JENNINGS

A bank competition I recently entered called for only two drawings, a plan, and a perspective. I believe those two drawings had far *better study* than would have been possible under the ten-drawings system.

I find myself obliged to stay out of most competitions because the terms are made too costly. A. B. J.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs:—My views on the competition question may possibly differ from those of other architects. I look on a competition as a continuation of the academic work that I did at school. If a man has never been to school I think that competitions for him should be a beginning of his academic work. I had to pay for my architectural training, and I have to pay for competitions; but the money paid for one or for the other goes for the same purpose, as far as I am concerned. If those architects who definitely disapprove of competitions could look upon it in this way—that competitions are but a continuation of school work—there would be one point gained. And if, further than this, they would lend their advice and criticism from time to time to the younger architects who are doing these competitions they would help architecture in this country.

I believe that there should always be a signed contract between owners who propose a competition and the architects who take part. The owner should bind himself to give the prizes mentioned in the programme and to award the building to the successful architect; and the architects should bind themselves to furnish the drawings in accordance with the programme.

A closed competition is admirable, especially for those architects included. I personally see no harm in a competition partly closed and partly open. This insures the presence of the best men and gives a chance to the younger generation. The money spent by these younger men in practical work is well spent; and I would prefer such extravagance to gambling in the stock market.

Very truly yours, HERBERT D. HALE.

FORTIETH CONVENTION OF THE AMERICAN INSTITUTE OF ARCHITECTS.

WASHINGTON, D. C., December 5, 1906.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs:—We are now ready to announce the conferring of the first Institute Medal upon Sir Aston Webb, R.A., Past-President of the Royal Institute of British Architects.

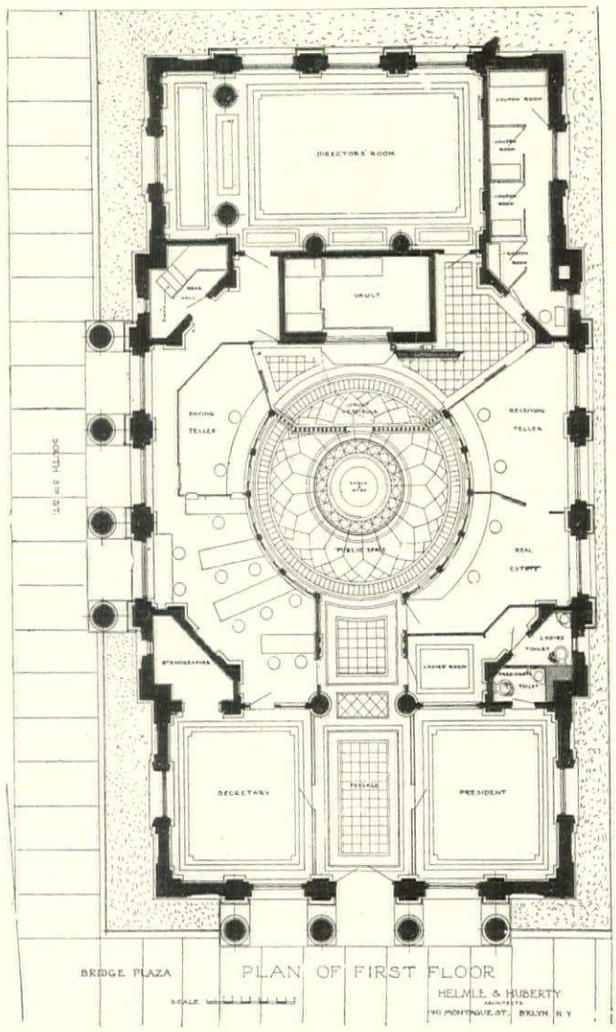
The convention will be held in Washington, on Monday, Tuesday, and Wednesday, January 7, 8, and 9. On the afternoon of January 9 there will be a reception at the Octagon House and the unveiling of a bronze tablet in honor of the founders of the Institute. On the same evening a former banquet will be given, to which will be invited distinguished representatives of the Government, the Fine Arts, Literature and Education. It is expected that the occasion will be as memorable as the banquet of 1905. Each member of the Institute is entitled to attend upon payment of $15 per cover, and may suggest to the Dinner Committee the name of one guest, for whom the member will pay an equal amount. I might say, if you can comment indulgently upon this high price and point out that it is absolutely necessary to cover the expenses of the distinguished visitors, I feel sure that you could render us a signal service, as many of our members have no conception of the total cost of affairs of this kind.

I would suggest, also, that you point out that the guests will include representatives from the leading universities and art institutions throughout the country, and that it is intended that the occasion shall be participated in by representatives of all the allied arts. Believe me, Very truly yours,

ALBERT KELSEY,
Chairman Publicity Committee.

ILLUSTRATIONS

BUILDING OF THE WILLIAMSBURGH TRUST COMPANY, BROOKLYN, N. Y. MESSRS. HELMLE, HUBERTY & HUDSWELL, ARCHITECTS, BROOKLYN, N. Y.



ADDITION TO HOUSE OF THOMAS HUNT, ESQ., TIVOLI-ON-HUDSON, N. Y MESSRS. LORD & HEWLETT, ARCHITECTS, NEW YORK, N. Y.

INTERIOR VIEWS IN THE SAME HOUSE.

FRONT VIEW: HOUSE OF J. J. ALBRIGHT, ESQ., BUFFALO, N. Y. MESSRS. GREEN & WICKS, ARCHITECTS, BUFFALO, N. Y.

LAWN FRONT OF SAME HOUSE.

ENTRANCE TO SAME HOUSE.

HOUSE OF DR. LESLIE GOLDTHWAITE, MILTON, MASS. MESSRS. WINSLOW & BIGELOW, ARCHITECTS, BOSTON, MASS.

HOUSE OF GEORGE EASTMAN, ESQ., ROCHESTER, N. Y. MR. J. FOSTER WARNER, ARCHITECT, ROCHESTER, N. Y.

Additional Illustrations in the International Edition.

ENTRANCE GATE: ESTATE OF J. J. ALBRIGHT, ESQ., BUFFALO, N. Y. MESSRS. GREEN & WICKS, ARCHITECTS, BUFFALO, N. Y.

ENTRANCE TO FOREST LAWN CEMETERY, BUFFALO, N. Y. MR. GEORGE CARY, ARCHITECT, BUFFALO, N. Y.

NOTES AND CLIPPINGS

PARKING THE SUBURBS OF VIENNA.—Although Vienna already possesses a far larger proportion of open spaces than does London, Paris, or Berlin, a project is being set on foot to preserve the forests and meadow-land surrounding the town, so that fresh air will be readily supplied and the inhabitants will have open country in their immediate vicinity. By this means the open spaces of Vienna will be increased five-fold.—*The Builder.*

AMERICANS RAISE RENTS IN THE LATIN QUARTER.—A cry has now been raised against the rich American in the Latin Quarter of Paris, and the poor art students complain that the rent of studios and cost of living is too much for them. In addition to the Americans who really study art are the women of the rich American colony who like to play at having studios "in the Quarter," in which they can have occasional afternoon teas. "We shall soon have to take to the cellars," is the lament of one foreigner, who sees the studios all snapped up by these Americans. —*Exchange.*

WAS HE ALSO A "LEADING ARCHITECT"?

Old Mojab Ben Bolt was a proud Arab chief—
At least so the legends inform us—
His family pride was beyond all belief
And his local prestige was enormous.

One day he decided on travels to go
And show all the world his great features.
For he said: "'Pon my word, 'tis a duty I owe
To gladden my poor fellow-creatures."

And so on a camel he hastened away,
'Mid his thoughts of himself—which were legion,
And he rode through the desert a night and a day,
Till he came to another chief's region.

Mohammed Ben Djem was its ruler sedate,
An Arab by nature pacific,
But his family pride was unspeakably great
And his local prestige was terrific.

When Mojab saw men to the other chief bow,
Whenever Ben Djem would command it,
Bewildered, he pressed both his hands to his brow,
For Mojab could not understand it.

"I thought in my greatness that I had no mate,"
Said Mojab, while riding home later.
"Oh, can there be other men equally great
Or—spare me the bitterness!—greater?"

He grew from that moment less proud and more wise,
Less pompous and more of a rover,
And this tale, gentle reader, to many applies.
I mention no names—think it over.

—*Thomas R. Ybarra, in New York Times.*

The American Architect and Building News.

Vol. XC. SATURDAY, DECEMBER 22, 1906. No. 1617.

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Twenty-five-foot Tenement-houses.

ILLUSTRATIONS:

Prize Designs in the Garden City Competition for Cheap Houses, Long Island, N. Y.: Eight Plates.

Additional: Royal Palace, Amsterdam, Holland—Town-Hall, The Hague, Holland—Town-hall, Alkmaar, Holland—Town-hall, Haarlem, Holland.

NOTES AND CLIPPINGS 200

BUILDING NEWS, ETC. iv

SOME months ago, in discussing the much-vexed question of the ownership of architects' drawings, we took occasion to express a doubt whether, after all, the architect was always their proper and safest custodian. The pertinency of this dubitation is made plain by an interesting condition of affairs that has declared itself recently in Toronto, Ont. At the death, some six or seven years ago, of the late Richard Windeyer, of that city, his heirs and assigns, having apparently no knowledge of architectural matters, seem to have considered the contents of his office as of no great value and, so, gradually or all at once, as the case may be, allowed the accumulation of soiled and tattered drawings and records, in portfolios, in rolls, in drawers, to disappear beyond the ken of man—they were so dirty and ragged, they seemed so futile and useless! Recently the Chapter of St. Alban's Cathedral decided that it was time to resume the building of the cathedral, and onto the choir, which for several years had been large enough to accommodate the congregation, build the crossing, transepts and two bays of the nave; but when they were ready to turn from the general to the particular, and overhauled the archives of the diocese, it was found that no trace could be discovered of the much-needed drawings, and no one remembered just what form Mr. Windeyer intended to give the completed building. Recourse was had, naturally, to Mr. Windeyer's family, but unavailingly. The drawings, if there ever had been any, had been destroyed as valueless.

AT this juncture some one who had a vague remembrance of the building's past history expressed a disbelief that complete drawings had ever been prepared, for it was recalled that the architect, the date of the laying of the cornerstone having for some reason been predetermined, had been allowed only six weeks for the preparation of his drawings, and consequently it was hardly likely that the drawings should be very complete or very numerous. Further search was therefore abandoned, and the work of continuing the building after such design as might please them was entrusted to new architects, the Messrs. Chadwick & Beckett. The search for the missing drawings seems to have been needlessly narrow, for, recently, the contractor who executed the carpentry-work on the choir has come forward with the declaration that, though it is true that Mr. Windeyer had only six weeks to prepare his sketches and the working-drawings of the choir foundations, he knows that, later, months were spent by the architect in working out complete drawings for the entire building: further, Mr. Hubble, the contractor in question, had and has sent to the Chapter a complete set of tracings of plan and elevation, as well as all the detail-drawings of the woodwork carried out in choir and chancel. It is not very material, perhaps, whether St. Alban's Cathedral shall be completed after its original or a new design, but the incident does clearly suggest that there is propriety and equitableness in the client's having an equal chance with the architect to preserve the drawings of his building, particularly in the case where erection is accidentally interrupted or intentionally carried out in stages.

WE believe it would not be a very difficult thing to work up a public demand for the revival of the old English law of deodand, so that its penalties might be enforced upon owners of automobiles which cause the death of any person. The State, which with us would have to exercise the rights of the Crown, would probably be willing to endow, with the large sums that the sale of these condemned chattels would produce, an orphan asylum or two to provide for the children of the victims. If, further, the same humane law of deodand should be applied to buildings, the treasury would be filled to overflowing after the sale of a single "high-building" made necessary by the death of some unfortunate housesmith. Here, too, the application of the law of deodand would not be illogical, though somewhat harsh, as capitalists would hold it, for just as the automobile is destructive through its too great haste, so a large part of the accidents that befall building-mechanics are due almost wholly to haste, particularly all those accidents which occur during the night-shift. How great is the casualty mortality amongst building mechanics, few people realize or endeavor to discover, but it should convince every one that something is seriously amiss when he learns that in a single city during the present season very nearly one-eighth of the men employed in a single trade either lost their lives or were seriously crippled by accident: in Chicago 156 out of the 1,358 members of the Bridge and Structural Ironworkers' Union shared this unhappy fate, a too-heavy dividend to pay.

THE revival of the law of deodand would also wonderfully advance the adoption and practice of municipal ownership, since, under its precepts, the surface car-lines and particularly the subterranean and submarine tunnels in and about New York, for instance, would have

Entered at the Post-Office at New York as second-class matter.

been forfeited to the public authorities over and over again. Deligent as the newspaper reporters are, it is doubtful whether all the serious casualties that occur in the various tunnels now building ever come to the ordinary citizen's attention, and it takes something spectacular, like the caving-in last week of a portion of Thirty-third Street, nearly abreast of the Waldorf-Astoria, to remind him that countless lives and almost as many millions' worth of real property are dependent daily on the knowledge, skill and sleepless diligence of the engineers who are responsible for the execution of these great bores.

AT a recent meeting of the American Society of Mechanical Engineers, Mr. Henry R. Towne pleaded for the appointment of a national commission to devise ways and means of simplifying our needlessly complicated, cumbersome and non-interchangeable systems of weights and measures. As, like ourselves, Mr. Towne is a confirmed opponent of the metric system—not that he, any more than we, is blind to its many advantages—and has argued cogently and conclusively against it before Congressional Committees, this recommendation of his is worthy of all heed. Simplification in this direction is a more worthy and useful undertaking than the fantastic and illogical assault on the spelling of the English language that has just been brought to naught, but it must be attempted by quite another order of brains than those that conceived the propriety of reforming the common property of millions by an executive order issued thoughtlessly by a single too-impulsive individual. Quite apart from the vast cost of the actual material waste that would be involved in the adoption of the metric system, there are too many good arguments to be advanced in favor of a duodecimal system, and there are too many good points in connection with the great number of factors in the "Babylonian sixties" to allow even advocates of the metric system to feel sure that the weight of evidence is wholly on the side of the system they espouse. But almost every one is agreed that the differences between Troy, apothecaries' and avoirdupois weights could be done away with to advantage, that a lengthening of the yard into agreement with the metre might have practical advantages, and that an interchangeability of weight and volume, after the fashion of the metric system, could and should be effected. We cannot believe, however, that the enthusiasm of theorists will ever succeed in imposing, unaltered, the French system on English and American industries.

THAT the paths of public-utility corporations are not always smooth and easy is shown once more by a verdict rendered last week in the Supreme Court of New York, a verdict of unusual interest since, if upheld by the upper courts, it places a new responsibility on those who deal in electric power, and, at the same time, places their treasuries to a considerable degree at the mercy of those insurance companies which until now have had to pay for fire-losses occasioned by short-circuits or other electrical faults quite as fully and promptly as if they had been caused by an overturned lamp or a mislaid parlor-match. The suit now decided awards $12,000 to the Continental Fire Insurance Company, which has been suing the New York Edison Company because of having to pay insurance on a block of buildings belonging to J. B. Haskins at Pelham and Third Avenues, New York, burned in February, 1900, and the subject of litigation ever since. The suit now decided is brought under an earlier decision of the Court of Appeals, which declares "that where a fire results in consequence of the negligence of an electric light, heat, and power company in installing electric wires in a building and in thereafter maintaining them, an insurance company, which has been obliged, under its policies, to pay losses resulting from such fire, becomes subrogated to the rights of its policy-holders and may maintain an action to recover the losses paid by it from the electric light, heat, and power company."

THE death of Willis Webb Polk, a Kentucky architect, in San Francisco, on November 30, at the age of seventy, is noteworthy, as it recalls the fact that there really was a considerable number of private soldiers engaged in the Civil War over and above the officers who have been glorified in history and immortalized in bronze. Mr. Polk more than once declined a commission, on the ground that it was easier to get good officers than good men of the rank and file. After an unusually strenuous career in the Confederate Army, he began life over again as a builder and architect in Louisville, where he built up a considerable practice, extending it later in life in Jeffersonville, Cincinnati and St. Louis. About a dozen years ago he moved to San Francisco to join his son Willis, who had established himself there some years earlier, thus bringing about that confusion of identities which always afflicts father and son of the same prenomen engaged in the same pursuit.

THE architect of the Pennsylvania Capitol is openly congratulating the public because, in the matter of the sculptured and mural decorations to be therein installed, the State is getting "double the value of its money." The matter of portraiture, which has attracted so much amused comment, will come up again in connection with the stained-glass windows which Mr. Van Ingen has designed for the Chambers of the House and Senate, which are said to be enlivened with portraits of living persons, but whether these persons are merely "types" or are politicians of the standard Pennsylvania stripe is not declared. It should be remembered that this turning of a public building into a portrait-gallery for politicians is not a new fad in Pennsylvania, since into the mural decorations of the Executive Mansion, erected some dozen years ago at Harrisburg, there was interwoven the portraits of many State politicians of the day. New Jersey seems to be inclined to take a different view, since it is said that Mr. Kenyon Cox, who, in a decorative painting for the Essex County Court-house at Newark, had introduced a portrait of the actress Miss Ethel Barrymore, who had been sitting to him recently, has been asked to substitute for hers a face whose loveliness, while equaling that of the original, may yet not advertise the actress.

THE T-SQUARE EXHIBITION.

THE management of the T-Square Club have endeavored to give to its exhibition this year, in the galleries of the Pennsylvania Academy of the Fine Arts, Philadelphia, an educational character in the broadest sense of the term. They hope that it will not only attract the profession and those more intimately connected with it, but that it may interest the public generally. To still further advance their end, the Academy and the T-Square Club have asked the National Society of Mural Painters, National Sculpture Society and the American Society of Landscape Architects to associate themselves in the exhibition, with a view to showing the executed work of the allied arts in connection with the drawings of the architects. The management has been able to secure a very representative exhibition in all these directions with certain work from other countries directly bearing on these subjects.

In the handling of the exhibition in the galleries, the management again has been most fortunate. The grouping is happily such that a visitor may find the exhibit bearing on his particular subject readily.

To the right of the staircase-hall are many of the drawings submitted in the recent competition for the Peace Palace at The Hague, together with an interesting collection of photographs of all prize drawings in this competition. In this connection the magnificent draughtsmanship displayed in the drawings of Messrs. Carrère & Hastings should be particularly noticed. The Shelby Court-House, by Messrs. Hale & Rogers; the Wisconsin State Capitol, by Messrs. Peabody & Stearns, and the Washington National Museum, by Messrs. Hornblower & Marshall, are also of great interest.

On the left, at the head of the staircase, the wall-space has been devoted to the general subject of Municipal Improvements, notably to those for Washington, D. C., of the drawings for which there is a very complete collection.

In the three rooms on the east front are grouped three categories of exhibits of very different character. First, drawings in black-and-white of executed work, with the related working-drawings, and in many cases accompanied by photographs showing the work completed, are in Gallery 1.

The drawings of Messrs. McKim, Mead & White, of the great New York terminal of the Pennsylvania Railroad, are shown for the first time in this exhibition, and are most interesting. Mr. Henry Hornbostel shows some of his drawings of the Carnegie Institute, of Pittsburgh, which, as examples of architectural study and draughtsmanship, are second to none, while the ecclesiastical work of Messrs Cram, Goodhue & Ferguson is well worthy of note. Messrs. Carrère & Hastings's delightful drawings for the New National Theatre in New York, which is being put up by the patrons of art in that city, will be of interest to all. Messrs. D. H. Burnham & Company's original sketches for the beautifying of San Francisco, made by Mr. Edward Bennett before the earthquake and fire, and from which he made the final drawings, which were destroyed in that fire, will prove of interest to all familiar with the San Francisco City Plan, and the development of this great improvement.

The central room contains a collection of photographs covering executed work of every sort, from the National Park Bank of Mr. Donn Barber, and the Indianapolis Post-office of Messrs. Rankin, Kellogg & Crane, through the whole gamut of architectural achievement, including country-houses of all sizes, university work and many photographs of the treatment of gardens, avenues and gateways in this country and abroad. As matters of particular interest, we should note a photograph of the banking-room of the Rochester Trust Company by Messrs. York & Sawyer; the exterior of Mr. J. P. Morgan's private museum in New York, by Messrs. McKim, Mead & White; a charming country-house, by Mr. George Bispham Page; the U. S. Court-House and Post-office at Marblehead, by Messrs. Peters & Rice, and some delightful views of the buildings at Bryn Mawr College, by Messrs. Cope & Stewardson. We should not leave this room without noting the model of the McKinley Monument, by Messrs. Lord & Hewlett, together with photographs of the executed work, and the statues by Mr. J. Massey Rhind, for the Indianapolis Post-office.

The third room contains a collection of sketches and photographs of foreign travel, which, in their spontaneity of execution, for the water colors, and in their remarkable selection of subject-matter and composition, for the photographs, will prove an inspiration to all who see them.

The drawings in color for work executed or in the course of construction, in the gallery following the Washington drawings, by Messrs. Charles Platt, Wilson Eyre, Brockie & Hastings, Benjamin Wistar Morris, Cass Gilbert, and many others, are all of interest as showing the care which the American architect gives to the study of his work.

There is a whole room devoted to the work of great French architects. M. Chedanne, architect to the Ministry of Foreign Affairs, shows his remarkable drawings made in connection with his study of the Pantheon at Rome. It was he who upset all the theories concerning the construction of this great dome and who established beyond all peradventure that his premises were correct. This set of drawings puts before the observer clearly the result of M. Chedanne's investigations, and, measured by their service to the cause of Roman Archæology, they are without question the most interesting drawings ever shown in this country, constituting unquestionably the *clou* of the exhibition. His other drawings of the Restoration of a Roman Temple, of the Decorations of a Roman House, and of his great "Champs Elysée Hotel" in Paris are also of great interest in their several ways.

M. Duquesne shows two drawings, these being a comparative study of two Italian Municipal Palaces, made while he was a resident of the Academy of France, at Rome, which, as samples of draughtsmanship and in their beauty of coloring, ably display his talent.

M. Lapeyrer shows a series of five drawings of his scheme for a great entrance boulevard to the city of Bordeaux, which are of much interest as showing that even the great cities of Europe have something left to do in the way of possible improvements and are undertaking them.

The large hall at the Academy is filled with the exhibits of the National Society of Mural Painters, who are much to be congratulated upon the scope of their exhibition. Up to the last moment, it was hoped that the mural decorations for the Pennsylvania State Capitol would be available, but the authorities at Harrisburg finally decided that they could not leave the building. There is a whole wall given to the work of Mr. John LaFarge, which is made up of the studies for, and of the photographs of, completed work. Mr. E. H. Blashfield has another panel, and Mr. William B. Van Ingen another. The centre of the room is occupied by a painting for a ceiling by Mr. Karl Newmann, of great brilliancy of color, while the room is full of charming panels and studies which speak highly for the great advance in work of this character that has been made in the country.

The central rotunda and the gallery adjoining contain the exhibits of the National Sculpture Society with four great groups from the New York Customs House by Mr. French, a tombstone by Mr. Calder, a model of the doorway of the chapel at Annapolis by Mr. Ernest Flagg, and a model of the Girard Trust Company's new building for the corner of Broad and Chestnut Streets, by Messrs. McKim, Mead & White, and Mr. Evan.

The rooms are made more attractive by many plants set in charming vases exhibited by Messrs. Henry A. Dreer, Inc., H. W. Moon Company, and the Andora Nurseries, while there are certain other exhibits of cabinet-work by Mr. John Barber, lighting fixtures by the Sterling Bronze Company, and other work by the decorative trades, which lend interest to the exhibition.

The end of the gallery and the end room are devoted to work by pupils in the architectural schools, designs in plan and elevation for all manner of problems which have been proposed and studied in the various schools of the country during the past year. It is an exhibit wholly creditable to the students whose work is shown, and will be very interesting to their fellows and to the public.

PROBING THE PENNSYLVANIA CAPITOL SCANDAL.—II.

IN our issue for November 24 we published the letter in which the Attorney-General for Pennsylvania demanded from the architect of the new State Capitol an explanation of his curious and unusual method of inviting bids. We did this in the expectation of being able to publish in the following week's issue Mr. Huston's reply, but in some way it escaped our notice, and we have been put in a position to perfect our record only after a month's unnecessary delay. To General Carson's inquiries, Mr. Huston and the general contractor interested make the following replies:

November 19, 1906.

HON. HAMPTON L. CARSON, ATTORNEY-GENERAL:

MY DEAR SIR:—In answer to your letter of the twelfth instant relative to the special furniture and fittings for the new Capitol building, I beg leave to reply as follows:

The specifications were prepared in the usual manner in my office, that is, a description of the kind and quality of the articles required, and that these specifications were prepared by me.

The knowledge I had relative to this subject was obtained during over twenty years in the practice of my profession.

Regarding my knowledge of the "per pound" and "per foot" rule, I would state that this principle of unit prices which you refer to was used by me in the specifications of the Capitol building, of which you have a copy, and which on page 18 read as follows: "Each bidder must state the unit prices called for on the blank form of proposal; and said prices will be used as a basis in the valuation of changes that may be required in the work and as further stated hereinbefore." The form of proposal, upon which estimates were given by contractors for the construction of the Capitol building, contained the items upon which unit prices were required.

I inclose herewith a copy of this form of proposal for your information, which you will note contains sixteen items, upon each of which an estimate is required, either by foot, yard, perch, thousand, or by the pound. I may also state that the above-referred-to clauses in the specifications and the forms or proposal are similar to those used by architects employed by the United States Government, other commonwealths and city governments, and in good private practice. This being my first public work of this character, when I saw the system had already been adopted in the schedules of the State for years passed, containing items calling for articles by the foot and by the pound, it was evident to me that it should be continued and used to cover the equipment of the new Capitol building.

This method is generally used by the trades in making up prices for bids, and is the common practice all over England.

I know in the practice of the arts in all lines the "per foot" rule is applied for the determining of costs and in the giving of bids by the above rule for wainscoting, bookcases, wardrobes, mantels, overmantels, cabinets, etc., and in the schedule of 1904 the items for specially designed furniture for the new Capitol building were framed to extend this principle to tables, chairs, desks and other articles of furniture.

I also know all metals are bought by the weight.

Upon investigation and research for lighting-fixtures of good quality and methods for buying same, I found that one of the finest examples for this quality of work and the method of having it performed so as to bring about the best ultimate result, was placed in the residence of Mr. William H. Vanderbilt, in New York, where all special lighting-fixtures were paid for by the pound in preference to by the piece, and that a more satisfactory and artistic result was obtained by this method.

I had in mind a standard of metalwork for this building which was beyond anything yet accomplished in this country. My precedent for the great bronze standards was obtained from the Pantheon, at Rome, and the altar-pieces in St. Mark's, in Venice, where I had replicas made for my guidance in obtaining a standard of excellence in this work.

Generally stated, if a bidder desired to bid by the piece instead of by the foot he had the design of each piece and a specification at hand. He could find the number of feet from the drawings, which were made to scale, and reduce it to the foot rule as requested by the schedule without any difficulty. There are two systems of determining the quantity of materials, weights and measures, and in many cases the one is used to determine the other.

In regard to the conferences with prospective bidders who are seeking business in my office, there are hundreds of them in the course of a year. I do not recall any of the nature you suggest.

I searched many places for precedents in this country and Europe. I visited Albany, Providence, Boston, New York, Washington and many other places, and necessarily had many conversations relative to this work, for I have done nothing but think and talk of this matter for many years. The only conference I recall relative to the preparation of the schedule for the articles required for the equipment of the Capitol building prior to the publication of the schedules, was in a meeting of the Board of Commissioners of Public Grounds and Buildings, at which all members were present, as well as yourself. I then went into the subject at length, and the Board adopted the unit-price system and had it incorporated in the schedule.

I gave my professional judgment, and I now think, as I did then, that it is the fairest system for the State on such unusual work.

No bidders made suggestions to me prior to the preparation of the schedule.

John H. Sanderson did not make any suggestions to me prior to the publication of invitations for bids or while schedules were being prepared.

I have no knowledge of the names of the bidders whose bids were opened. I have no record of them on file. Previous to each advertising I had no conferences or conversations with such bidders. Having had no such conversations, I was not affected in my judgment by the same and did not adopt any suggestions by bidders in whole or in part, and did not incorporate any such into the schedules.

I did not suggest the placing of Item 2 in the schedule and do not know what it was intended to cover. I would further state that I did not suggest any of the items from 1 to 20 inclusive in the special schedule.

I was asked by the Board to prepare such items only as would be required for the special furniture and fittings which would come under my supervision.

My answer to your eighth, ninth and tenth questions is the same as the above, as they relate to Item 2.

A special design does not necessarily call for the "per foot" rule. Neither does it necessarily for the "per piece" rule; the unit-price system having been adopted for the schedule, it was so adopted to this furniture. A special design is made to order after detail drawings and is not ready-made from stock. For example, in a room, the architectural style of which is French, the furniture would be designed in the French style; in a Doric room, Doric detail; in a Corinthian room, Corinthian detail; Greek room, Greek detail; English room, English detail; Gothic room, Gothic detail, etc.

This illustrates to you the theory of design which was applied to the Capitol building, the idea being to produce a harmony of design in each room.

The drawings and specifications were on exhibition in this office on the days authorized by the Board from about May 7 to June 7, 1904. I did not keep a list of the various firms estimating on the work. The drawings were examined during office-hours, from 9 A.M. to 5 P.M.

No objections are on file in this office, and no communications of that character were received, and, therefore, no report made to the Board for the reforming of the schedule.

You will note on page 14 of the Capitol building specifications the following clause relative to verbal inquiries:

"Neither the Commission nor the architect will be responsible in any manner for verbal answers given to inquiries regarding the meaning of drawings and specifications or for any verbal instructions, whether by themselves, their employees, or others, in advance of the award of the contract. The bidder will be responsible for any and every error in his proposal."

A similar clause is in all specifications for this work. The reason for such a clause is, an architect must so protect himself and his clients against any such irregularities as your letter suggests.

I have devoted conscientiously five years of my life to this work.

I was called upon by the Commonwealth of Pennsylvania to design a Capitol commensurate with her dignity. My issue was to produce a building which would combine utility, stability and beauty. I gave my best, and all of the artisans and artists employed on the building have given their best, and I repudiate the insinuations that are being made. We have tried to do our duty honestly and well. If I have made any mistakes, they are mistakes of judgment and not of intention, and I stand ready to do all I can to correct them. I based all my judgments upon the highest precedents, and followed the instructions of my clients to the best of my ability.

In regard to extravagance, I say there is no extravagance—there is richness of design. We must advance artistically as well as commercially, and this building is the artistic expression of the culture of this great State, which will tell of us to coming generations.

Art is not a necessity, but architecture is one of the last refining touches which strikes a problem, and it is richer when embellished by the sister arts of sculpture and painting, as this building will be, and I believe thousands upon thousands of the good people of this and other States will enjoy this work for all the coming years, and the total cost of it of $1 per cubic foot, including all the sculpture, painting, furniture, document filing cases, vaults, lighting-fixtures, art bronze and all expenses, is reasonable and capable of being favorably compared with any other public or private structure of a like monumental character, and since, in the Capitol building time was one of the important features of the contract, so, in my instructions from the Board, all diligence and dispatch would be used. The completion of this

entire work within the time of forty-six months, and occupied by all the departments of the State, is unprecedented.

Hoping that the answers which I have given to your questions will be satisfactory to you, I am,

Very truly yours,
J. M. HUSTON.

Mr. SANDERSON, the general contractor under the Board of Public Buildings and Grounds, replies as follows:

PHILADELPHIA, PA., NOV. 17, 1906.

HON. HAMPTON L. CARSON, ATTORNEY-GENERAL:

MY DEAR SIR:—I beg to acknowledge the receipt of yours of the 10th inst., containing twenty-eight further questions for me to answer.

I herewith submit my answers to each question in regular order:

First.—Is the bid "per foot" on the basis of "surface measurement," the usual method of determining the value of articles of furniture? Is it known generally or partially to the trade? Have you yourself used it in other contracts outside of the Capitol contract? If you answer yes, how often have you used it, and to what extent? If you know of others using it, was it in contracts similar to that of the Capitol contract?

Answer: It is not a usual method, but is frequently employed. I believe it is known generally to the trade. I have used it in other contracts; in fact, it is applicable to all contracts where similar furnishings are required, and it is the only rule that can be applied to most of the work referred to under Item No. 22. As a matter of fact, it has been the custom of the Board of Public Grounds and Buildings for many years to advertise and specify furniture and other articles to be furnished "per foot," and I, as well as other contractors, have bid upon and furnished furniture and other articles under such schedules and specifications to the State of Pennsylvania.

Second.—How are these surface measurements taken? In an article like a chair or a sofa or lounge, the seat and back of which are stuffed and covered with leather, either plain or tufted, what portions of the surface are used in order to determine the price? Is the measurement by the square foot or the linear foot? Is it confined to the woodwork or does it include the leather and upholstery? In chairs or sofas, not upholstered, how would the surface measurements be taken? If there is any difference in method, what effect would such difference have upon the price?

Answer: In answer to your second question, I would say that surface measurements are taken by the height, width and depth. In an article like a chair, sofa or lounge, all portions of the surface, including leather or upholstery, are used in order to determine the price. In chairs and sofas not upholstered the measurements would be taken in the same way as described above and there is no difference in method. It is the superficial area that is measured. Notwithstanding the fact that this method has been the custom in prior contracts, I was not allowed payment under this contract of my bills in all instances upon this basis, but was compelled to accept the measurements fixed by the architect.

Third.—In a sale of articles by the piece, as shown in trade priced catalogue, or by samples in warehouses or salesrooms, what method is used to determine the price at which the article is offered?

Answer: The method used to determine the price of any article under this head is based (1) upon its cost and (2) upon the price it can be sold for in a competitive market.

Fourth.—Did the specifications on which bids were invited point out the method by which values were to be determined?

Answer: Yes. Either by article or by measurement or by weight.

Fifth.—Was there any reference to the "per foot" rule in the specifications? If there was, in what words did it appear? If there was not, why was it adopted?

Answer: Yes. In a number of items bids were asked "per foot," as follows: [Mr. Sanderson here gave a list of fourteen items under this rule showing that bids had been asked for furniture, fittings in wood, stone and bronze, mural and art paintings, decorating and painting, designed sofas and desks, parquetry flooring, Venetian-blinds, sculptural decoration, special designs in carpets and antiques, rugs, special Wilton carpets, designed curtains, bacarat glass and tiles.]

Sixth.—Was there in the specifications anything which would render it plain that a different method of measure and valuation could or should be adopted between the methods of valuing the articles called for by Item 2 and Item 22? If you answer yes, what was there which would so indicate it to the trade or to brother bidders?

Answer: Yes. Item No. 2 calls for "leather-covered, easy arm-chairs (mahogany), Series F, each—" a specific article at a definite price each, whereas, Item No. 22, "designed furniture, fittings, furnishings and decorations of either woodwork, stone, marble, bronze, mosaic, glass and upholstery, Series F, per foot," calls for specially designed articles of widely different character, at a price per foot. This, to my mind, makes it perfectly clear to any bidder that a different method of measurement or valuation would be adopted in the cases of articles furnished under the two items.

Seventh.—Were all articles described in Item No. 2 of the Special Schedule Series F, valued by the piece? If so, what method was used for determining their value? I understand from your letter that all articles furnished under the above item were not furnished by the foot. This suggests the employment of another method. What was that method?

Answer: Yes. They were valued by the piece. I do not know what method was used by the Board of Public Grounds and Buildings for determining their maximum value mentioned in the schedule, and on which I bid a certain percentage off, if that is what you mean. I only know that I offered and was willing to furnish them at a specific price each. I did not furnish any articles under Item No. 2, either by the piece or by the foot, as none was ordered, and I would not have had any right to furnish and charge for them by the foot if they had been ordered.

Eighth.—What was the number and character of the articles furnished under Item No. 2 of the Special Schedule Series F? Were the prices in all cases such as would belong to goods of a commercial character, such as could be found in stock anywhere?

Answer: As I said above in answer 7, I had no orders under Items No. 2, and therefore did not furnish anything. However, the prices in my bids under that item covered articles of a commercial character such as could be found in stock anywhere.

Ninth.—What is the meaning of the phrase "specially designed" articles as used in connection with Item No. 22?

Answer: "Specially designed articles" are articles usually designed by an artist or architect to attain an ideal condition, to carry out in detail the ideas of fitness and appropriateness of each article to its surroundings, and to develop a harmonious effect which could not otherwise be obtained; something unusual, different from the ordinary, and with an individuality of its own, and their application has reference to a singular or particular condition or place which may never occur again. "Specially designed" articles are made from specially designed patterns constructed specially for that purpose, which patterns are of no general use after the specially designed articles are made.

Tenth.—Was the "per foot" rule used in determining the value of all articles furnished under Item No. 22?

Answer: Yes.

Eleventh.—If you answer the preceding question in the affirmative, why was the "per foot" rule used in this connection?

Answer: Because the schedule required bids "per foot."

Twelfth.—Why should a special design make it necessary to adopt the "per foot" rule? Why could not the articles have been furnished at so much a piece?

Answer: A special design does not make it necessary to adopt the "per foot" rule. Some articles could have been furnished by the piece, but were not so specified in the schedule.

[In answer to the question as to whether the "per foot" rule could be used in determining the value of articles of a commercial value, Mr. Sanderson said that the "per foot" rule was equally applicable to commercial articles, but is rarely used, because such articles are usually catalogued and illustrated. And, therefore, the price per piece is used, because it is necessarily understood by the average buyer. And, he added, that it would not have any effect on the price to supply goods per foot.

Then taking up the question of specially designed articles, he said:]

A specially designed article of any kind would necessarily cost more than a regular article by reason of number, character of design, unusual dimensions, character of finish, character of material, etc., etc. Therefore, no fixed percentage of increased cost in any one article could be arrived at.

There is no certain limit as to increased cost of a specially designed article. It would vary with each article. As I said in Answer 12, some of the articles under Item No. 22 could have been purchased by the piece, but were not so specified. Others in the same item could only be priced by measurement.

The application of the "per foot" rule did not make the total cost of the articles under Item 22 any greater than if they had been specified in a different way. All "designed furniture, fittings, furnishings and decorations of either woodwork, stone, marble, bronze, mosaic, glass and upholstery" were furnished under Item No. 22. I have had no orders to furnish anything under Item No. 2. The number and character of the articles furnished under Item No. 22 will be found in the orders given by the Board of Public Grounds and Buildings, copies of which orders are in a book in the Auditor-General's office.

[Mr. Sanderson then said he had received a complete and specific order for each and every article from the Board on Public Grounds and Buildings and he inclosed a copy of the schedule, which showed that for all the different articles furnished there was a maximum price attached, beyond which the bidder could not go, the thermostats, for instance, being specified as coming within $100 each. Clock fittings within $150 each, and so on through the list.

Referring to this schedule, Mr. Sanderson says:]

You will see at once that opposite each item the maximum

price is stipulated for all work coming under that item. I had no option to bid any other way. It would not involve computation, as the price was stipulated at so much "per piece," "per foot," "per pound," and "per yard." Where the "per foot" rule was not specified the price was fixed per article. Where the "per foot" rule was specified the computation was made, as previously stated.

If you will examine the copy of the schedule submitted, in answer to question No. 20, you will see that it does not mention any certain number of articles to be furnished under any item, but the bidder was called upon to offer to furnish any quantity of the articles mentioned in the different items that would be required for the "equipment of the new Capitol Building at Harrisburg." My bid, which was accepted, obliged me to furnish all the articles in the special schedule at the prices named.

[He inclosed a letter from J. M. Shoemaker, dated June 7, 1904, which notified him that he had been awarded the contract for furnishing all supplies, articles, and materials, and performing all work required under the "special furniture, carpet, fittings, and decoration schedule for the equipment of the new Capitol Building, embracing Items 1 to 41, inclusive, of said schedules."

Mr. Sanderson, in answer to the question as to whether there was a limit as to the number of articles, said he furnished nothing under Item 2, in which articles were scheduled by the piece, and that the articles furnished by him were limited by specific orders and by his proposals. As to the question of subcontracts, under Item 2, he said:]

My contract with the State required me to furnish the articles mentioned in the schedule upon which my bid was accepted at the prices therein named. The quantity of material that I furnished and the price charged for the same are set forth, item by item, in the orders given me by the Board of Public Grounds and Buildings, copies of which, as I have already said, are in the Auditor-General's office. With these before you, you can learn what was the number of articles I furnished and the price which I charged for the same, and if you can find in any respect any mistake made by me I will cheerfully correct the same. I submit, however, with all due deference, that my rights under the contract and the State's rights thereunder are in no way affected by the cost to me of the articles, or by the fact that I did or did not sublet the contract.

[Mr. Sanderson then took up the question of the bronze-fixture contract, Items 31 and 32 of the schedule. He refused to answer any questions about the subcontractors under these schedules, and said he would make the same answer as to "per pound" standard as he had made as to the "per foot" standard. He denied specifically that he was in partnership with anybody, individual or corporate, and he answered "no" to the question, "Did any one have any interest with you in the profits, either directly or indirectly? If you answer in the affirmative please give the names of the parties and state the extent of their interest."]

Anticipating any further queries that may occur to you in this connection, permit me to point out a very material fact which has been completely ignored or overlooked, and that is that the maximum price in the schedule, per item, was fixed by the Board and therefore on such items as No. 22, for example, it was necessarily an average price because it covered articles of a widely different character, cost, composition, design, and manufacture, and although some of the articles furnished under that item actually cost a great deal more than the price bid, I made my proposal at a lower rate than those costs because other articles cost less, as I was compelled by the wording of the schedule to make an average price.

Public attention has been directed in every case to articles which any one can see did not cost as much as the average price, but no attention has been called to highly ornamental and expensive articles which cost far more than the average price, and the unjust criticism caused by, and the wide publicity given to these groundless charges have been the means of paralyzing my business since the agitation began, and have caused me a serious financial loss.

I was compelled to make my bids on schedules prepared by the Board of Public Grounds and Buildings, which schedules in the main followed the forms that had been used at Harrisburg for more than ten years. Other people had the same opportunity to bid with these schedules before them, and they availed themselves of that opportunity. Bids were required for some articles by the piece, for some by the pound, for some by the foot, and for some by the yard. In this respect the schedules did not depart from what had been in prior schedules for years.

In conclusion let me say that in the Auditor-General's office may be found my bids that will show you for what I agreed to furnish each one of the articles under the different items. In the same office will be found certified copies of each bill that I presented, which will show what I declared I delivered, and what I declared was the price due for the articles delivered.

The State Treasurer's office will show every dollar paid me. With all this data before you, it would seem to me that you would have no difficulty in discovering (1) whether I delivered the articles which I agreed to deliver, and (2) whether I charged the price which I agreed to charge. I think that you should go to that source of information and make your investigation, and then report if you find that I have in any way whatever departed from the terms of my contract.

I now repeat that, if you find in any respect whatever that I have not fulfilled my contract with the State, I am fully responsible and willing to do it, but if you find that I have fulfilled my contract then I am entitled to a public declaration from you to that effect in order to vindicate the name of the direct representative of an honored and respected family, whose business record in this community extends over a period of nearly a century, whose integrity has never been questioned, and whose reputation has never been sullied with even the suspicion of having received a dishonest dollar.

I beg to remain, very truly yours,

(Signed) JOHN H. SANDERSON.

THE ENGLISH CLASS-ROOM.

IT is usual in England to allow at most 15 square feet of floor-space and 200 cubic feet of air-space for every occupant of a class-room. This makes the average height of the rooms about 13 feet 6 inches, or less if more floor-space is allowed. But here considerations of lighting and of the necessary height of the windows make themselves felt. It is generally assumed that a room 25 feet wide can be sufficiently lighted if it is 13 feet high. Considering, however, the fogs from which so many large towns suffer, and the diminution of light to which town buildings are liable from other causes, it is both wise and considerate to lean rather to excess than to deficiency in the amount of window-opening. The class-rooms may be all the healthier if more than 15 square feet of floor-space per pupil can be given, though this depends on the efficiency of the ventilation—a matter which has hardly had its proper share of attention in elementary schools, and about which we may have some suggestions to make. On the other hand, class-rooms with much more than 15 square feet of area per head are costly to build, expensive to warm, and, unless the classes are small, trying to the teacher's voice. The alleys or gangways from which the seats are entered should be from 18 inches to 20 inches wide when the desks are placed singly. When the desks are in pairs, these alleys should be at least 2 feet wide. If a door opens into an alley (an arrangement better avoided), that alley must be widened proportionately.

Having these figures to start with, we may apply them to an imaginary case, and show more definitely how a class-room can be planned. We will assume that twenty pupils are to be accommodated, seated at single desks, with a gangway between each two desks. Allowing a space 18 inches wide between the desk-ends and walls, etc., and a space of 1 foot behind the back seat, and an interval of 7 feet between the front row of students and the wall behind the master's desk, towards which they face, twenty desks, each 2 feet wide, may be arranged in a block, so that there are five in depth and four in breadth, that is—five, one behind the other, facing the master's end of the room, and four side by side counting from his right to his left. As it is usually best, and often essential, to have the main windows on the pupils' left hand, a plan which, like this one, has five desks in depth to four in breadth, is better than one with four desks in depth and five in breadth, because then none of the pupils need be more than about 14 feet from the light. If there were five desks in breadth, the farthest pupils would be 17 feet 6 inches from it, which often has to be the case, but which is not quite an ideal arrangement. Looking next at the length of the room from the master's end to the wall facing him, we begin with the space in which he stands, say of 7 feet wide running across the room from side to side. Then come the five desks and seats which face him one behind another. Each desk and its seat takes on the average 3 feet in depth, or 15 feet altogether, and the hindmost seat should be a foot or so from the wall. It thus appears that a class-room for twenty students, four in width and five in depth, lighted from the student's left side, may be taken as 23 feet long and 15 feet 6 inches wide,

Multiplying 23 feet by 15 feet 6 inches, the area of this room is found to be just under 360 square feet, and dividing 360 by 20 (the number of the students), it results that each student is provided with an area of nearly 18 square feet. If the average height of the room is 13 feet, then 13 × 18 gives 234, as the cubic feet of air provided for each.—*The Building News.*

COMMUNICATION

TWENTY-FIVE-FOOT TENEMENT HOUSES.

To the Editors of the American Architect:

Dear Sirs:—In your issue of October 27 appears a letter from Mr. Rasmussen, a practising architect of Brooklyn, and at that time still a member of the Society of Architects—a society formed within the past year for the purpose of uniting the efforts of individual, every-day business architects in friendly relations with each other, thereby promoting their common interests and insuring a legitimate standing in the community, and at the same time furthering the interests of the public specially investing in and seeking to promote Brooklyn's growth.

One of the earliest efforts of this Society was directed toward the adoption of means for correcting notorious defects and abuses in the administration of the Brooklyn Tenement House Department. Mr. Rasmussen at the outset was one of the Society's most strenuous and demonstrative members and co-workers, being unsparing in his denunciation of the evils complained of. For some reason, best known to himself, however, he has entirely changed his attitude; and in a spirit of manifest hostility toward his associates he has issued letters for publication criticising their proceedings and impugning the motives of several members, in a manner which cannot but eventually recoil upon himself to his own discredit and loss.

We feel bound in honor to reply to the letter, for the reason that Mr. Rasmussen's points are either entirely without foundation, in fact, or else its statements are mere repetitions of facts well in hand, and in some cases entirely misleading to those who may be interested in the questions at issue. Reference is made by your correspondent to what he would do with a 25-foot lot in New York, so as to avoid the "alcove room or curtain-pole house." We challenge him to plan and produce a 25-foot three-story six-family house which would attract a Brooklyn builder, renter, or a buyer for any of thousands of locations where only very moderate prices could prevail. If, moreover, Mr. Rasmussen has bonâ fide evidence of any case wherein, through the contrivance of the occupant of the apartment, movable wardrobes, dressers, etc., have been so arranged that two rooms have been "converted into four rooms, thus creating two dark interior rooms, which have no provision for ventilation or light of any kind," your correspondent, having the enforcement of the tenement-house law so greatly at heart, ought to inform the officials of such violation of the law.

It would interest us to know what became of the plans Mr. Rasmussen had in application for permits with the Department at the time when the Department prohibited the use of so-called "alcove rooms," and which plans showed such rooms. We are aware that he was greatly disappointed when informed that they were classed with the "railroad flat" and must be altered before a permit could be issued. Your correspondent's intuition should have told him that his own plans constituted an infraction of the spirit, if not the letter, of the law.

It is surely more to the credit of the alcove architect that he fights for and protects his client's rights rather than take that client's money during a legal process and business transaction while letting him strangle and writhe without redress.

Mr. McKeown, the local Deputy Commissioner, has had absolutely nothing to do with the prohibition of alcove rooms; his duty is merely to carry out the instructions of his superiors or lose his position.

It is the hope and endeavor of this Society to bring about the appointment of practical officials, familiar with the law, appreciative of existing facts and conditions, and with "back bone" enough to carry out their convictions.

We have differed in many respects from previous incumbents of the office, but we feel and express indignation at the utterances of your correspondent regarding the "everlasting shame" attaching to those worthy ex-officials, some of them men of high standing, honorable reputation and practical experience, whose untiring energies were devoted to placing the tenement-house law on a working basis, who formed part of the Legislature's committee, and were themselves framers of the law.

We will welcome an opportunity during the coming session of the Legislature at Albany to have Mr. Rasmussen substantiate his position antagonizing this Society and the interests of his clients, if he thinks he can do so.

The *American Architect* may be assured that there are real grievances in existence which ought not to be made light of: substantial proof of this fact, with a view to remedial legislation, might be obtained by canvassing the situation among the practising architects coming into actual daily contact with the Department complained of.

Respectfully yours,
Society of Architects.
F. Buchar, *Secretary.*

1774 Pitkin Avenue, Borough of Brooklyn, N. Y.

ILLUSTRATIONS

THE GARDEN CITY COMPETITION.

A jury consisting of Messrs. Allen W. Evarts, William R. Mead, and Dean Alvord submitted the following report on the competition held a few weeks ago by the Garden City Company:

New York, October 24, 1906.

Gentlemen:—Your committee, appointed to prepare the programme, pass upon the design and render the judgment in the competition which you have held for the selection of suburban house-designs, begs to submit the following report, which, owing to illness or absence from the city of one or more of its members, has been delayed until the present time:

In reaching its decision, your committee has been influenced largely by its study of the plans, and has found the external expression of the plans, with but few exceptions, disappointing. Much weight has been given to the arrangement of rooms with reference to their exposure to the prevailing breezes; and, to a certain extent, designs have been favored which, from the style adopted, are capable of slight variations in the exterior treatment without modification of the plan.

Of the plans for the single houses, approximately two-thirds were of the same general type, viz., a central entrance and hall, with the large living-room at one side, and the dining-room, kitchen, etc., at the other. In another somewhat numerous class, the long axis of the plan was at right angles to the direction of the street, thus presenting the narrower front toward the street. In view of the wide frontage of the lots, this type of plan is not considered desirable. In many other plans all the rooms were placed in a row fronting the street, and, while this type is preferable to that last named, it is open to the objection that the distance between the houses (in block plan) is reduced to a minimum, and that the windows of the kitchen and other service portions face the street.

Your committee believes that the type of house first named, with its central hall and rooms on either side, gives a feeling of freedom and spaciousness which will generally appeal to the average tenant of a suburban house, coming as he does from a city apartment or narrow city house, and this type has therefore been favored in the award.

In the designs for the double houses, the committee has favored plans in which the entrances to the houses were separated by a considerable distance, and in which the porches were not placed side by side; also, as in the case of the single houses, they have considered the question of exposure in relation to the prevailing breezes. In general, the drawings submitted for the double houses, while fewer in number, were more satisfactory in design.

The total number of designs submitted was 99, of which 72 were for the single houses and 27 for the double houses.

Of the fourteen prizes, eight have been awarded to the single houses and six to the double houses.

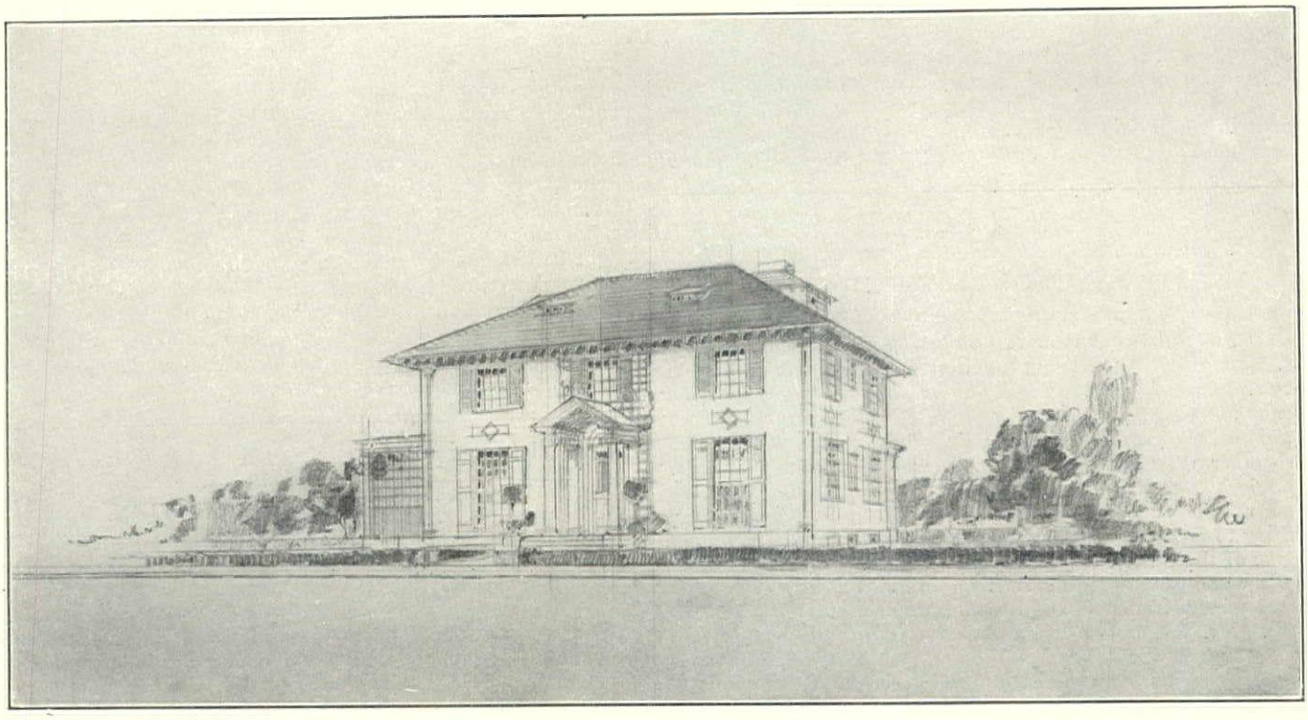
After the committee had reached its decision, the sealed envelopes containing the names of the competitors were opened, when it was found that the following were the authors of the premiated designs:

SINGLE HOUSES.

First Prize.—J. Lovell Little, Jr., Boston.

Second Prize.—William Leslie Welton and Gordon B. Pike, New York.

$100 *Prizes.*—Herbert Hugh Riddle, Chicago, Ill.; Edmund B. Wells, New York; Aymar Embury, second, New York; Lionel Moses, second, New York; Moller & Smith, New York; Charles Floyd Livermore, New York.



SECOND-PRIZE DESIGN FOR SINGLE HOUSE: GARDEN CITY COMPETITION. SUBMITTED BY W. L. WELTON AND G. B. PIKE.

DOUBLE HOUSES.

First Prize.—Aymar Embury, second, New York.

Second Prize.—Midgley Walter Hill and F. Arthur Fairbrother, New York.

$100 *Prizes.*—Gordon B. Pike and William Leslie Welton, New York; Herbert Hugh Riddle, Chicago, Ill.; Tallmadge & Watson, Chicago, Ill.; Moller & Smith, New York.

Very respectfully,
ALLEN W. EVARTS,
WILLIAM R. MEAD,
DEAN ALVORD.

FIRST-PRIZE DESIGN FOR SINGLE HOUSE, SUBMITTED BY MR. J. LOVELL LITTLE, JR., BOSTON, MASS.: TWO PLATES.

SECOND-PRIZE DESIGN FOR SINGLE HOUSE, SUBMITTED BY MESSRS. WILLIAM L. WELTON AND GORDON B. PIKE, NEW YORK: TWO PLATES.

FIRST-PRIZE DESIGN FOR DOUBLE HOUSE, SUBMITTED BY MR. AYMAR EMBURY, 2ND, NEW YORK.: TWO PLATES.

SECOND-PRIZE DESIGN FOR DOUBLE HOUSE, SUBMITTED BY MESSRS. MIDGLEY W. HILL AND F. ARTHUR FAIRBROTHER, NEW YORK: TWO PLATES.

Additional Illustrations in the International Edition.

THE ROYAL PALACE, AMSTERDAM, HOLLAND.

THE TOWN-HALL, THE HAGUE, HOLLAND.

THE TOWN-HALL, HAARLEM, HOLLAND.

THE TOWN-HALL, ALKMAAR, HOLLAND.

NOTES AND CLIPPINGS

GAS HELPING OUT ELECTRICITY.—The largest gas-engine driven electric plant thus far noted is to be installed for the Milwaukee Northern Railway, a new inter-urban line that will extend from Port Washington, Wis., to Milwaukee. Three horizontal twin tandem gas-engines, each with a rated capacity of 1,500 horse-power, will be direct-connected to three 1,000 kw., 3-phase, 25-cycle alternators. These generating units will be installed in the main power-house at Port Washington on the harbor front, where coal can be unloaded conveniently to the gas producer plant. The six gas-engines and alternators mentioned, together with the gas-driven exciter sets and equipments for the eight sub-stations to be used, are of Allis-Chalmers manufacture.—*Engineering News.*

THE VALUE OF SPRINKLER PROTECTION.—It appears that during the twelve months ending October 31 there were thirty fires in Boston in warehouses and manufacturing risks that were equipped with automatic sprinklers. It is stated that in no one of these buildings was the property valued at less than $50,000, while in a number of instances the insurance upon building and contents amounted to hundreds of thousands of dollars; yet the aggregate loss in these thirty fires was only $5,722.74, or an average loss of $190.75 per fire.

PREVENTING THE DECLINE OF INDIAN STONE CARVING.—Efforts are being made in India to prevent the decline of the art of stone-carving. The real home of the art is in Orissa, and there the most beautiful work in the way of decorative carving is produced by skilled workmen who are well paid at 3½ rupees, or 4s. 8d., a week. Nevertheless, the art is declining. Mr. Havell, the principal of the Government School of Art at Calcutta, suggests that two interior doorways in the new Art Gallery in Calcutta should be carved by the best men obtainable from Orissa. If, say, 3,000 rupees were set apart for this purpose out of the grant for the purchase of works of art in the coming year, the Art Gallery would then possess good examples of modern native stone-carving, which might be the means of diverting some, at least, of the large sums spent in Calcutta on inferior sculpture and architecture toward the preservation of the splendid art of Orissa.—*The Building News.*

EXTENDING CHICAGO'S PARK SYSTEM.—Chicago, however, plans to go far ahead of Boston. Believing that in fifty years it will swell out four times greater than its present size, with a population of eight millions, the metropolis of the Great Lakes authorized a commission to draw up an outer park system commensurate with its big ideas. This commission has made its report, and advocates the acquisition of thirty-seven thousand acres, extending twenty-five miles into the country, and costing, it is estimated, about $25,000,000. To the north, where the shore of Lake Michigan rises into bluffs with wooded ravines, there is to be a park of seven thousand acres; in the west another of eight thousand acres. The valley of the Desplaines River, skirted by woods and meadows, is to afford a park drive twenty-five miles in length. In the southwest the forests of the Palos region are to be made into a park larger than the Blue Hills Reservation, near Boston, and toward the south a preserve around Lake Calumet will afford a recreation space for the toilers of South Chicago and Pullman. Then there are many more smaller parks proposed, eighty-four in all. At present Chicago has 3,169 park acres, so that the addition of the outer park system would make a total of forty thousand acres, or nearly three times the size of the Island of Manhattan.—*New York Times.*

The American Architect and Building News.

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SOCIETIES, PERSONAL MENTION, BUILDING NOTES, ETC. . . iv

IT is distinctly peculiar that men who suffer much and frequently through and because of the follies of trade unionism should ever consent voluntarily to enter the ranks of a union, and yet that is what those architects have done who have persuaded their State legislatures to enact architects' license laws. If alliance were made for mutual protection against the ill doing of the labor unions, the step would be defensible; but, no, the object is really to secure a preferential treatment of those who can enroll, an increased assurance of income through the cutting down of competition, and the maintenance rates, in essentially the same ways and with obviously the same spirit that governs the actions of the labor unions. The assertion that the securing of added safety to the public is the object of the architects' license laws is the shallowest of humbugs. There has always been grave doubt as to the constitutionality of these license laws which place a burden on some men that others are free from, and it is with real satisfaction that we learn that this point is likely to be settled for one State at least, and, curiously enough, that State is California, where the labor unions have such a throttle hold on progress. Early in December, ten California architects were arrested for practising their profession without having been licensed so to do by the State Board of Architects, and they and some two hundred others who are allied with them in this movement intend to fight the case through every court until the constitutionality of the act has been established or overthrown. Among the architects named we recognize some who have every moral right to practise their calling unchallenged; men who, if they chose, could successfully meet any test the Legislature has ordained. With these men it is evidently a matter of principle that is at stake, and they deserve the applause and support of that considerable majority of their fellows in every part of the country who disbelieve in the necessity or advisability of license laws.

OUR readers must have perused with much interest the letters we published last week from the architect and the contractor for the "furnishing" of the Pennsylvania Capitol, the letter of the latter so manly and straightforward, the former's so evasive and so flippant. After taking nearly a month to delve deeper into the matter, Attorney-General Carson has addressed another long letter of inquiries to Mr. Huston, in which he assures him that the questions "require full, candid, explicit and detailed answers," and reminds him that "generalities must be disregarded and merely argumentative replies must be avoided." Evidently the correspondence is destined to be too lengthy for us to report in full, but we expect to be able to find space to give, when it finally appears, the testimony that may be adduced in support of the novel experiment of bidding on the products of the art industries by the pound. If the case ever comes before the courts, it will be a matter of real interest to learn the names of the architects who may be summoned by Mr. Huston to give expert testimony in his behalf.

IT was only natural that, following so speedily on the dedication of the Pennsylvania Capitol, the long-delayed opening for public use of the Hall of Records in New York should have attracted interested attention, and that a serious attempt should be made by newspaper managers to discover just what has been the cost of the building and whether there is to be an aftermath of scandalous disclosures, after the Pennsylvania fashion. Considering the variegated history of the building, it can but be said that the outcome might easily have been worse than it is, and that it is not a matter of much consequence that, after all, Messrs. Horgan & Slattery did not succeed in reintroducing into the building all of the marble interior finish which their predecessor was compelled, through their advice given to Mayor Van Wyck, to eliminate from his drawings and specifications. There is that much more marble left for use in other buildings. The most curious revelation in connection with the building is the statement that, at the time when he designed the building, Mr. Thomas was unable to ascertain from anyone in authority precisely for what needs he was to provide space and communication. He, therefore, contented himself with designing his exterior and a staircase-hall of a monumental type and then divided up the balance of the space on each floor into eight large rooms of nearly equal size, repeating the distribution in each story, trusting that when the officials moved in they could in some way or another make themselves at home.

THE shadow of Bellona seems always to be cast athwart our militia armories, for there seems to be always never-ending contention connected with their

Entered at the Post-Office at New York as second-class matter.

building and furnishing, as more than one architect can testify, and not seldom the architect himself is the responsible cause. This seems to be particularly the case with the armory for the Sixty-fifth Regiment at Buffalo, which it was understood was to be left in Mr. Metzger's hands at the time when the Supervisors of Erie County took the rest of the county work from him. It seems, however, that they later made an attempt to oust him from the armory job, and it required an opinion from the Attorney-General for New York to convince them that they had no power in the matter, since the armory is being built under the direction of the State Armory Commission, in whom, and not in the Supervisors of Erie County, rest the right to discharge the architect, if such a step should be found advisable. At about this juncture it was learned that Mr. Metzger was about to let the contract for a special system of ventilation for the armory building, which would probably consume some twenty thousand dollars of the county funds; and upon this the County Auditor declared he would never pay out the money for any such purpose, unless compelled by the highest court in the land, for, if the State was building the armory, the State should provide the money; or if the County must provide the funds, then it should control their disbursement. If Senator Hale, who in the United States Senate last week stated that two-thirds of the country's annual income was now expended in paying for previous or preparing for future wars, had but known of the Buffalo armory squabble, he might have increased his estimate by a perceptible fraction.

EVERYONE knows of instances where testamentary provisions having a generally beneficent aim have, for one reason or another, been brought to naught; but it is not common to find beneficent or progressive action thwarted by a testamentary provision whose general purpose and intent are absolutely praiseworthy. An instance of this kind is to be found in the bequest made to Yale University by the late Professor James M. Hoppin, long connected with the School of Art there. Professor Hoppin bequeathes sixty thousand dollars for "the establishment of a professorship of architecture" in the Art School, but awards the income of this sum to his son Benjamin for life. We do not know, of course, what the son's life-expectancy is and so have no means of guessing how soon Yale may be able to establish an architectural department; nor have we any reason for supposing that the authorities have any desire of establishing such a department at once or before the bequest will actually come into their hands. But it seems plain that some Yale alumnus interested in architecture might desire to endow such a department to-morrow, only to find himself forestalled by Professor Hoppin's bequest, which, nevertheless, is for the moment held in mortmain so far as the university's needs of to-day are concerned. A somewhat analogous case is to be found in the Waring Professorship of Sanitary Engineering at Columbia University, which is endowed by a memorial fund raised by the friends and admirers of Colonel George E. Waring. The chair of Sanitary Engineering still stands vacant and the classes are non-existent because, owing to the conditions under which the fund was raised, Mrs. Waring has the income of it for life. But the chair is established, and a new benefactor would hardly feel like establishing a second one.

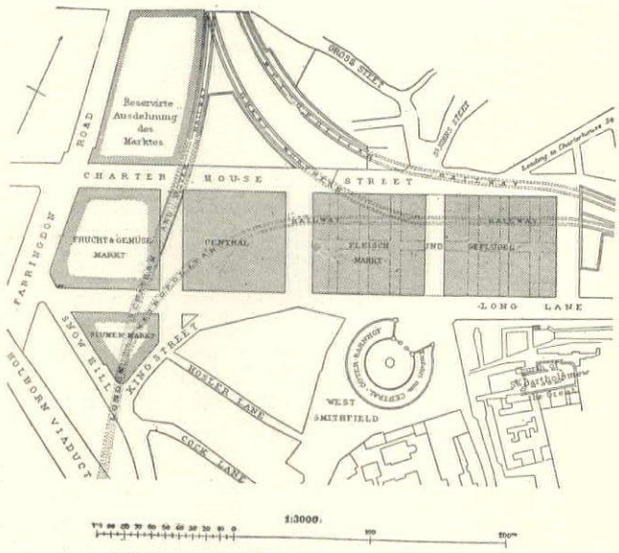
THE "good citizen," if also he be wide-awake, is a most useful creature, and we feel that Bostonians will do well to urge on the authorities that they shall take action on the suggestion of Mr. Edwin D. Mead and secure the site and building lately vacated by the Harvard Medical School, so as to provide space for the future extension of the Public Library. The activities of that institution are so great and varied that already it is perceived that many years cannot elapse before enlargement of the building shall become imperative and, as the providing of more space through the piling of new stories above the present successful façades is an unthinkable solution, it is obvious that these needs can only be satisfied in a logical way by extending the building over the Medical School site at the rear.

MR. MEAD'S suggestion seems to have been too good to be heeded, for we now learn that it is reported that a new theatre is to be built on the Medical School site, a theatre of a very select type, as befits its neighborhood to Beacon Street and the West End residential district. As we recall the site, it seems very inadequate for such a purpose; but Boston, which, in spite of its provincialism and Puritanism, is known as a good "show town," realizes that so long as the admirable Boston Theatre endures there is no chance for another large theatre, and so is content to build a seemingly endless series of small play-houses. There is, however, an ever-recurrent hope that a good modern opera-house may be built either on Copley Square or near Park Square, on the grounds vacated by the Providence Railroad.

AS to those grounds, Mr. John Albree has gone to the expense of printing and distributing a costly pamphlet, which he styles "A Blight on Boston," in which he develops the enormity there is in allowing to lie idle, undeveloped and unproductive, the territory occupied by the station and yards of the Boston & Providence Railroad before it was compelled by the Legislature to unite with other railroads and make use of the South Terminal Station. The pamphlet is distinctly interesting and ingenious, once one can disabuse one's self of the notion that Mr. Albree is meddling with a matter that only concerns the owners of the land, who, of course, have a right to let it lie fallow while waiting for a customer, if they so choose. But, even here, Mr. Albree shows that the land belongs to the stockholders in the railroad, who probably do not realize that their directors are indirectly depriving them of some three hundred thousand dollars a year in the shape of possible income and actual taxes. Mr. Albree's argument is in a measure symbolic of the impatient temperament of so many Americans who are quite unwilling to leave to future generations a fair chance of dealing with any portion of the globe's surface in a manner that may suit their times and their ideas of what is fitting.

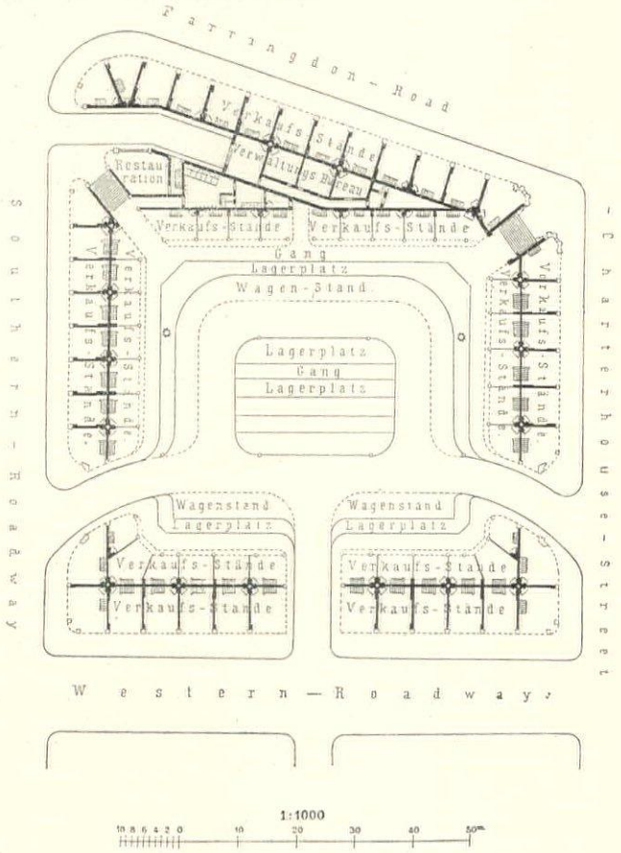
SANITARY FEATURES OF MARKETS AND ABATTOIRS[1].—II.

MARKET buildings should be inexpensively designed, but be thoroughly sanitary. They are constructed either of they should be built in a substantial manner and so as to brick or stone, or of iron and glass; wooden structures should not be tolerated. Where it can be avoided, such buildings should not be placed in a closely built city block; buildings placed on



LAYOUT OF SMITHFIELD MARKET, LONDON.

open squares and standing entirely detached are much preferable. Provision should be made for the easy access to the market for all kinds of vehicles and trucks.



FRUIT AND VEGETABLE MARKET, SMITHFIELD, LONDON.

The chief constructional requirements are the following:

(1) The halls must have ample light;

(2) They must not be draughty, yet must be well ventilated;

(3) They must afford plenty of floor space and storage room;

(4) They must have plenty of exits and passageways, also driveways for the loading and unloading of wagons;

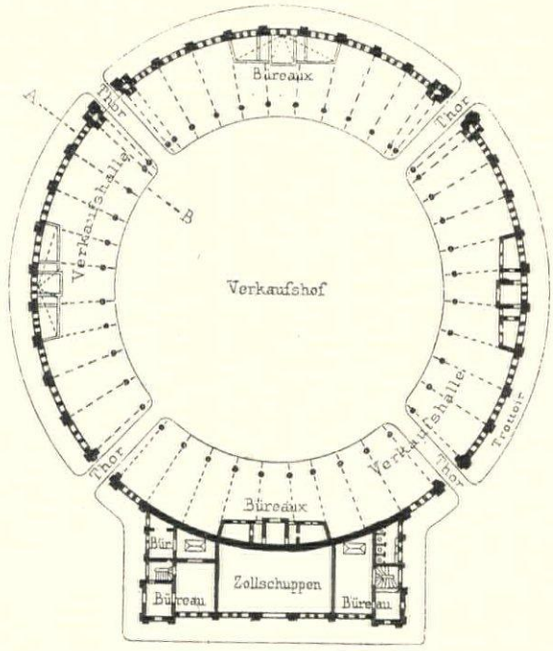
(5) They must be well and substantially constructed.

[1]Continued from No. 1616, page 188.

Ample floor space is an essential requirement, and hence market structures generally cover a large area of ground. Suitable provision must be made for a number of wide entrances and exits to facilitate the market traffic. Wholesale market buildings require suitable arrangements for loading and unloading the trucks which carry the provisions and the wagons of market-gardeners from the rural suburbs; also driveways for the carts and wagons of the buyers, and rail connections with the available freight lines for the prompt receipt of provisions coming from long distances. All driveways require to be well paved and drained.

The interior of a market building is usually a one-story lofty hall-structure, covered either by wide-span roof-trusses or having smaller roof divisions, supported by intermediate iron columns. The columns are not objectionable, as they can be utilized in the division of the sales-stands. The whole interior is subdivided by several longitudinal main aisles, each being from ten to fifteen feet in width, with numerous passageways or cross aisles at right angles to them, the cross aisles being made from five to seven feet wide.

Woodwork should be avoided in market-halls for well-known reasons. The walls should be of iron or steel and glass, or else of brick. Perfect cleanliness being an essential requirement, the walls should be finished with a non-absorbent material to a



Grundriss.

MEAT-MARKET, BRUSSELS, BELGIUM.

height of at least six or seven feet. For this purpose the walls may be faced with glazed bricks, or they may be lined with white tiles, or else be simply plastered with hard plaster or cement, which is often painted with light-color enamel paint.

The construction of the floor is of much importance. It may be of cement, of asphalt, or of hard-burned paving brick. It may also be laid with large square slabs of marble, or be tiled, a rough tile being preferable, as it does not become slippery.

The buildings generally have cellars with cool vaults for the storage of provisions left unsold. The cellars may be arched over and the floor made waterproof and finished either in asphalt or in cement, or with asphalt paving blocks, or hard-burned paving-bricks; sometimes a marble mosaic floor is used. Hydraulic or electric lifts should be provided to take the food supplies down to the cellar.

The interior equipment is generally quite simple; the spaces formed by the aisles and cross-aisles are subdivided into open, or sometimes closed or housed-in sale stalls. These are usually raised one step above the floor level of the hall. The stalls are fitted up with tables and chairs, with benches and chopping-blocks, with racks, shelves and iron stands, fitted with numerous large hooks. The usual subdivision is into stands for meat and poultry, for vegetables, for fruit, for dairy products, such as eggs

and butter; for fish, oysters, lobsters and other sea food. The meat and fish stalls require a more careful fitting up with marble, slate or soapstone table boards. Large fish markets are provided with basins filled with either fresh or salt water for the keeping of live fish and lobsters; occasionally some stalls are reserved for keeping for sale live fowls.

The upper floors or the galleries are utilized for offices for the food-inspectors and officials of the sanitary police, also for the superintendent in charge of the market building, for his assistants and for the market cleaners and employés. Sometimes a dining-room or restaurant is provided.

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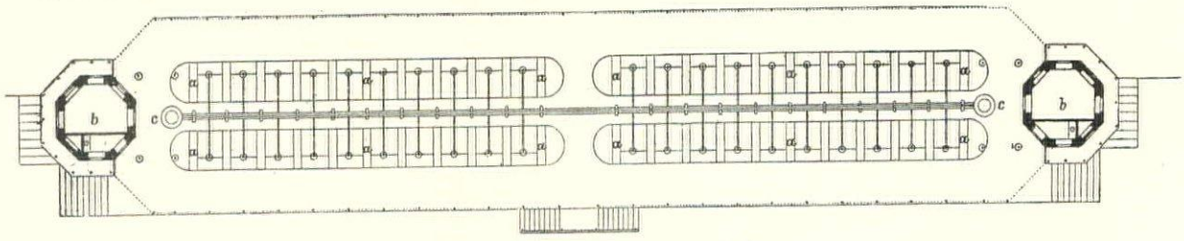
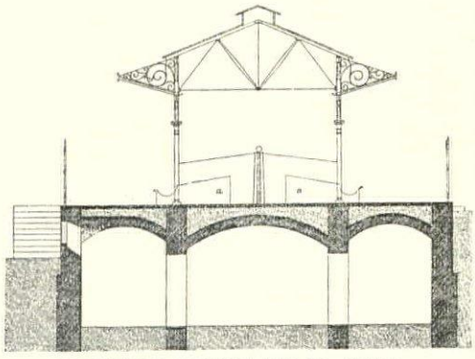


VEGETABLE MARKET, MILAN, ITALY.



VEGETABLE MARKET, MILAN, ITALY.

Modern market buildings are almost always provided and equipped with a refrigerating and cold-storage plant, and in addition to numerous large refrigerators there are included artificially cooled rooms for the storage of meat, poultry, eggs, butter and other products which become easily affected by the heat.

Where refrigerators and cold-storage chambers for ice are used, the waste-pipes for the melting ice must be properly and safely disconnected from the soil-pipes and the sewer. It must be borne in mind that meats, fish and other articles of food are quickly spoiled when exposed to sewer emanations.

The maintenance of cleanliness in market buildings is of paramount importance, hence particular attention should be paid to the sanitary equipment. Good sanitary conditions require the provision of a plentiful supply of water and suitable and ample arrangements for the flushing of the floors and the washing of walls. In the floors there must be plenty of well-trapped drainage openings, which in turn must be sewer-connected. For the washing of the floors and the flushing out of the floor cesspools numerous hydrants or sill-cocks with connections for rubber hose must be installed. Separate well-kept and sanitarily arranged toilet-rooms for both sexes are needed.

Market-halls should be well ventilated. Ventilation is generally accomplished by means of high side windows, fitted so as to swing on a horizontal axis, or else by raised ridge roofs with louvre windows. Good ventilation is of paramount importance in market buildings, not only because of the large crowd of persons who visit the market daily, but also on account of the necessity of removing the strong odors due to some of the supplies, like fish, cheese, meat, etc., and finally because it is necessary to maintain the food supplies in a good condition. At the same time it is important that the lower part of the market-hall should be free from annoying and objectionable draughts. Provision must be made to heat the building in winter time.

Ample daylight illumination is essential, supplemented by gas or electric light for the dark winter mornings. Plenty of light is also a safeguard against the possible sale of food which has begun to decay; it is likewise necessary for the maintenance of cleanliness.

Floors and passageways of market-halls, as well as the surrounding streets, should be kept scrupulously clean. To accomplish this, constant vigilance and care must be exercised by the officials in charge of the building. Decomposing vegetable or animal food should not be permitted to accumulate, and in order to maintain healthful conditions a daily or more frequent removal is imperative. During the hot weather frequent flushing with water and the occasional application of approved disinfecting liquids should be practised.

All pavements and floors should be non-absorbent and should be well drained to prevent the formation of stagnant pools of filthy water. Galvanized iron covered receptacles should be used for the collection and removal of waste bits of food, butchers' offal, etc. Water-tight covered carts should be provided for the removal of waste matters; open carts should not be tolerated. The removal of condemned food and of all waste and offal should be regular, prompt and efficient; a daily removal is absolutely necessary. Pending transportation all waste should be stored in tight, well-covered and well-kept galvanized-iron receptacles. Strict regulations and rules for the sanitary maintenance of market-halls should be issued by the municipal board of health, and a daily inspection is required for the enforcement of the rules. In addition to the sweeping of the market-halls daily, attention should be paid to the passageways and to the streets adjoining a market.

WM. PAUL GERHARD.

(To be continued.)

TOWN EXTENSIONS IN GERMANY.

MR. T. C. HORSFALL, of Manchester, Eng., recently delivered before the Association of Municipal and County Engineers an address on the planning and control of town extensions in Germany. He said that in the long periods in which the two movements of population had been taking place in England—the movement from the villages and small towns into large towns and the movement from the central districts of large towns into the suburbs—similar movements had also been taking place in Germany. But though the movements had been the same in kind, there had been considerable difference in degree. The population of the large German towns had increased in higher degree than had that of our large towns, but the movements towards suburbs had been less marked in Germany than here.

But the greatest difference that had to be noted between the two countries in connection with the movement of population was in the nature of the new districts which had been built to receive the increase of urban population. In England vast areas, in what were a few years ago the fringes of our towns, had been covered with new streets, nearly all of them narrow, which lie between long rows of small houses all very much alike. In most of these new districts very little vegetation existed; from the windows of the great majority of the houses in them no trees or flowering plants were to be seen; and though most of our large towns had provided in the new districts a park or parks, which, as a rule, were kept in an excellent and most attractive state, the immediate surroundings of the majority of the houses were so devoid of all that could create and keep alive desire to see beautiful things in the majority of the inhabitants that the parks were not only distant in space, but were also remote from the thoughts and feelings of most of them. In these new suburban districts there was also a great lack of playgrounds for children. We all know that in the districts in question there is so little to facilitate the living of a full and healthy life that the aid of the public-house, the music-hall, the betting agent must be almost as welcome there as in the older parts of the towns; for men and women would have some change from the sensations created in them by monotonous work, and if they could not get it, as many of them were willing to do in the occupations made possible by the existence of the beauty of nature and of interesting human productions, they would seek it in the use of alcohol and other dangerous ways. Of the author's

own beloved town, Mr. Justice Day had said that it was no wonder that cases of drunkenness were common there, as to get drunk was the shortest way out of Manchester.

The new districts of German towns were so constructed that a stranger often could not tell, when he passed through one of them, whether it was inhabited chiefly by rich or by poor people. Nearly all the streets were wide, many of them were planted with trees; there were many small open spaces, made attractive with plants; public buildings were so placed as to add interest to as large a proportion of the district as possible. The tree-planted street was considered of so much importance that the *"Statische Jahrbuch-deutscher Staedte"* always contained a table which told not only how many parks a town had, but also how many tree-planted streets and the total length of such streets. Thus they learned that Cologne had about 375,000 inhabitants, had 285 tree-planted streets, the length of which was 64½ miles, and that the manufacturing town of Elberfeld, which had 157,000 inhabitants, had 27 tree-planted streets 19 miles long.

It would be difficult to overstate the value to the inhabitants of German towns of such places and of tree-planted streets. Large numbers of parents resorted to them on summer evenings, and on Sunday evenings with their children, and while the children played in almost complete safety the parents rested on the benches provided by the town. His attention was drawn to the high value of planted trees and open spaces many years ago by the statement made by one of the London coroners that he held, on an average, more than fifty inquests a year on children killed while playing in their only playground—the street; and he had, therefore, ever since tried to find out, when he had been abroad, how foreign children fare in respect of the chance of playing in safety.

The chief reason for the very great difference between the new districts of German towns and those of English towns was that German municipal authorities, in common with those of every other civilized country except England and perhaps the United States, had the power to control the growth of their towns by making town-extension plans, the arrangements indicated on which must be complied with by all owners of the land which was within the boundaries of the town, and by all who build on it. In Prussia the power was formally given by a law, passed in July, 1875, known as the Street-lines and Building-lines Act, but the power had been exercised for a long time before that Act was passed.

It was the few words "lines can be laid down for single streets, or parts of streets, or, to meet the foreseen needs of the near future, can be laid down by means of building plans for larger areas," which give German municipal authorities the power to save their people from the degradation which English suburban districts are bringing on theirs. These words had received a very large interpretation. The foreseen needs of the near future were taken by the most enlightened authorities to mean the needs of the next twenty or thirty years, and hence building plans were sometimes made for very large areas. A few years ago the *"Municipal Authority"* of Düsseldorf published a plan for an area of nine square miles. The words were held by most of the authorities to give them not only the power to decide what streets shall be made, what shall be the width and direction of each, what squares, small planted open-spaces, playgrounds, and parks shall be provided, but to give them also the power to create different zones or districts—districts for dwellings, districts for manufactures—each with building regulations differing from those of other districts. This power had been largely used, and with extremely good results.

The building plan was prepared by officials who had received the training of surveyors, and whose experience gives them some knowledge of engineering and of the tasks of the architect. These officials always, he believed, work under the supervision of a committee consisting of men cognizant of the various interests which had to be taken into account.

Land was held by far more persons in Germany than in Great Britain; the plots held by many persons were small, and many of the plots had been strips of a few furrows in width which had been left by farmers to their children. These plots, being long and narrow, could not be used separately as sites for buildings, and therefore when a building plan was published by a municipal authority many sales or exchanges of property were needed before building could take place. In order to quicken this difficult process Dr. Adickes obtained the passing of a law, which was known as the "Lex Adickes," which was at first intended for the whole of the Prussian Kingdom, but which was eventually restricted in its application to the town of Frankfurt. It enabled the Town Council to expropriate all the land in a new urban district temporarily, to deduct from the whole the land needed for streets and open spaces, and finally to redistribute the residue among the original holders in plots of shapes suitable for building purposes, each owner contributing land in proportion to the value of his original holding.

German towns suffer far more than ours do from high rents and from the inevitable result of overcrowding of dwellings. While the evil of overcrowding in Great Britain was felt, as a rule, only by the poorest class, in Germany a large number of persons of the middle class were compelled by the dearness of houses to occupy inconveniently small dwellings. To enable municipal authorities to remove or mitigate these evils the Governments of Hessen and Saxony had passed housing laws in the last few years which had already lessened the evil of overcrowding in some parts of those two countries.

The new Prussian Housing Bill proposed by building by-laws to regulate—

1. The graduating by districts, streets, and squares of the extent to which sites shall be covered by buildings.

2. The separation of particular districts, streets, and squares in which the erection will not be allowed of buildings which are likely, in working, to cause the neighboring inhabitants or the public danger, injury, or annoyance by diffusing bad smells, thick smoke, or unusual noise.

3. The plastering, painting, or pointing of buildings mainly serving as dwellings and of all buildings situated on streets and squares.

4. Proceedings against buildings which disfigure the streets or public places in towns or country places.

The German Governments, and all German students of the housing problem, know that towns cannot be brought and kept in a condition which shall make it possible for human beings to have good health, physical, mental, and moral, in them solely by means of the town building plans and of the building regulations which form part of such plans. They believe that Town Councils must own much land, and for this purpose must have the right to buy it whenever they can get it as private persons may. They are convinced that every house containing small dwellings, and the servants' and apprentices' rooms in large houses, must be carefully inspected at not very long intervals of time; that co-öperative and other societies must be encouraged to build wholesome small dwellings by being provided by direct or indirect aid from Government, with loans of money at low rates of interest, and that Town Councils must be enabled to obtain a considerable proportion of the money needed to defray the cost of making towns habitable from the persons who now gain most by the growth of the towns, by being empowered to rate land on its selling value and levy rates on unearned increment. Legislation for all these objects has been already passed by several Governments, and is promised in the near future by the others. But while the importance of all these other things is admitted by all German social reformers they all know that the supremely important thing is the building plans. In all lists of the measures needed to insure that towns shall be made less dangerous to health and strength than they now are the improvement of the building plan and its necessary concomitant building regulations has the first place. No one connected with a German town, rich landowner, or poor landless tenant, doubts that it is necessary for his welfare that such plans shall exist. In Professor Baumeister's book on the enlargement of towns the English towns are mentioned as the only modern examples known to him of the monstrosity of towns built without any plan at all. He trusted that our towns would soon cease to have this evil distinction.

THROUGH THE SIMPLON TUNNEL.

AS the tourist season now beginning is certain to witness an enormous flow of traffic through the Simplon Tunnel, on the part of travelers bound either for the Milan Exhibition or for the exquisite region of Lake Magiore, which the new Italian approach line from Arona to Domo D'Ossola opens up, and again, on the part of those desirous merely of experiencing a trip through the longest tunnel in the world, some notes about the journey and the rail service inaugurated on June 1 may prove of interest.

Strictly speaking, the traveler does not begin to realize that he is traversing a new international thoroughfare until he has left Lausanne. Formerly even the charms of the scenery could not wholly compensate for the glare, heat, and tedium of the

journey up the Rhone Valley. But with half an hour knocked off the old schedule between Lausanne and Brig, and with only four halts in the ninety-mile run, things are very different. This, the Swiss approach to the mammoth bore, has already been furnished with a double line for half of the distance and relaid with steel sleepers. The gradients and curves are severe, but a magnificent six-wheel-coupled locomotive makes light of both, and the train may be relied upon to wipe off whatever time has been lost between Paris and Lausanne.

It is not generally realized that electric traction is already installed between Brig and the station of Iselle at the Italian portal. But only the "direct" trains, in contradistinction to the through expresses, are electrically operated. The latter make no stop between Brig and Domo D'Ossola, whereas the former call at Iselle, and there change the type of locomotive power. The electric locomotives somewhat resemble those formerly used on the "Twopenny Tube," save that they are much larger (weighing sixty-two tons) and more powerful, being capable, in fact, of hauling a maximum load of 465 tons at a speed of twenty miles per hour, while the current is taken from an overhead construction by means of a bow collector, instead of by a shoe making contact with a "live" rail.

The passage of the tunnel is far more pleasantly accomplished in an electrically-hauled train owing to the absence of smoke and fumes. Moreover, in an electric train one can peer out of window to observe the entrance to the tunnel and to realize better the immensity of the superincumbent mountain. But care must be taken in looking out of window, for the poles from which the feed wires are suspended are placed very close to the track. Inside the tunnel the wires are anchored to the roof. The sparking of the bow collector gives the idea of the train being piloted into the tunnel by a guiding star, while in the tunnel it creates a ghostly blue haze ahead.

The architecture of the Swiss portal is unpretentious, and the entrance to the parallel shaft—which, should it be found necessary, could be completed in the course of four years, and then be used as a second tunnel—is hidden from view. On the Italian side, however, the twin portals are side by side, and contained in an imposing ornamental granite façade, inscribed with the dates 1898-1905.

Directly a train enters the tunnel a canvas screen mysteriously descends and seals the entrance. It is just as though the portal were a proscenium and the screen a drop-scene. The curtain being down (and it remains down until each train has cleared the tunnel), the leviathan fans at each extremity are delivering fresh air into the parallel shaft, and at the same time exhausting the foul air from the tunnel itself, so that every train is always running against a purifying draught, which almost attains the velocity of a head wind.

The time occupied by passenger trains in negotiating the great tunnel, whose exact length is twelve miles and 458 yards, varies according to the direction in which they are traveling and the kind of motive power employed. The quickest journey is made by the southbound electric trains, viz., eighteen minutes, and the longest by the steam-hauled, northbound through expresses, viz., twenty-five to twenty-eight minutes. The northern half of the tunnel, 10,000 yards in length, has an incline of only 1 in 500, in order to drain off the water, whereas the southern half, 11,000 yards long, has an incline of 1 in 143. Owing to the steepness of the latter, the northbound journey in a steam train is the more exciting. There is a stop at Iselle to detach the pilot-engine which has assisted the train up the heavy grades on the magnificently-engineered approach-line from Domo D'Ossola.

Presumably in order to catch passengers who are merely journeying through the tunnel, luncheon or dinner is served on leaving Domo D'Ossola or Brig. The practice is annoying, as it hinders travelers from drinking in the grandeur of the scenery on the twelve-mile run through the wild, romantic gorges of Gondo, while it is impossible to eat in comfort when the train is climbing up the southern half of the tunnel.

Every window must be closed, in the dining-car the temperature soon reaches an appalling heat—indeed, it often attains 95 degrees Fahrenheit. The heavy train toils up the ascent with a sound like the rhythmical beating of muffled drums. The windows are enveloped in an opaque mist. One experiences a pressure on the ears. The electric light burns dimly. Now one realizes that the train is in a tiny drain hole, with the massif of Monte Leone 7,000 feet above the roof, and that during construction the awful weight of the mountain was such that it threatened to crush galleries and workmen alike, and did actually crumple up the most solid iron constructions which were used as supports. One remembers the stories of the hot and cold torrents which poured out of the inmost recesses of the mountain and annihilated everything which came in their way. Is science sure of its triumph, or are the genii of the Alps about to inflict some terrible revenge upon the mortals who dare thus to journey through their vitals?

In the suffocating Turkish-bathlike atmosphere, in the subdued light, perspiring waiters dump food before diners whose appetites have left them.

A reverberating roar and the flashing of green signal-lamps notifies that the train has at last reached the level stretch utilized as a crossing place, on the summit. Windows are hastily opened and a great sigh of relief goes up as refreshing draughts, untainted by smoke, circulate through the car.

Quickly gathering speed, the train rushes down the incline toward the northern exit. Steam being shut off, glimpses of the unlined walls of the tunnel, the openings of the transverse galleries that communicate with the parallel shaft every two hundred yards, and the electric signals at frequent intervals are obtained. Finally the train emerges into daylight, and for some few seconds the eyes are dazzled by the sunshine and foaming glacier water of the Rhone, which races the train into Brig station.

The approaches to the Simplon Tunnel cannot compare with those of the St. Gothard for scenic splendor, neither do they attain to the same degree of engineering magnitude. This is due to the fact that the Simplon Tunnel is the lowest of the four Alpine perforations. Nevertheless, the line from Iselle to Domo D'Ossola is a skilful and thrilling piece of work. Eleven miles long, it descends 1,175 feet to the latter important junction, crossing and recrossing the mountain torrents on bold bridges, plunging into six tunnels, with an aggregate length of 8,067 yards, and frequently incased in massive stone snow galleries. There is but one corkscrew tunnel. The latter, which is nearly two miles long, makes a complete loop, and the difference of altitude between its portals is 307 feet.

As might be expected, the trains contain a large number of passengers who are merely "doing" the tunnel. Many make a combined rail and road trip of it, and pick up the train at either Brig, Iselle, Vargo Preglia, or Domo D'Ossola. But gone forever are the twenty diligences per day which formerly plied on the celebrated Simplon road. No public vehicle now patronizes the pass save a two-horse postal curricle, which does not carry passengers. —*London Mail.*

THE WHITE HOUSE AND CAPITOL COMPETITIONS.

ON July 16, 1790, Congress passed a law authorizing President Washington to select a site, not exceeding ten miles square, within certain limits of the Potomac River "for establishing the temporary and permanent seat of government of the United States." Early in January, 1791, President Washington appointed Thomas Johnson and Daniel Carroll, of Maryland, and David Stuart, of Virginia, Commissioners, with power to fix, locate, and survey such site, and to establish metes and bounds. When such preliminaries had been accomplished, and the federal district named the "Territory of Columbia," they still had on their hands a wilderness, with no residence for the President and no quarters for Congress. This great need is evidenced by the following advertisement appearing in the *George Town Weekly Ledger* of Saturday, March 31, 1792, and reads as follows:

Washington in the Territory of Columbia

A PREMIUM

Of a lot in this City to be designated by impartial judges, and FIVE HUNDRED DOLLARS or a MEDAL of that value, at the option of the party, will be given by the Commissioners of the Federal Buildings to the persons who, before the 15th of July, 1792, shall produce to them the most approved plan, if adopted by them, for a CAPITOL to be erected in this City; and TWO HUNDRED AND FIFTY DOLLARS or a MEDAL for the plan deemed next in merit to the one they shall adopt. The Building to be of brick, and to contain the following apartments to wit:

A conference room { sufficient to accommodate
A room for representatives { 300 persons
A lobby or ante-chamber to the latter { these rooms
A Senate chamber of 1,230 square feet area { to be
An ante-chamber, or lobby to the left { of full elevation.

Twelve rooms of six hundred square feet area each, for committee rooms and Clerk Offices, to be half the elevation of the former. Drawings will be expected of the ground plats, elevations of each front, and sections through the buildings in such directions as

may be necessary to explain the internal structure, and an estimate of the cubic feet of brickwork composing the whole mass of the wall.

The COMMISSIONERS.

March 14, 1792.

As we of to-day read this advertisement there is one feature in it which stimulates our risibles,[1] and that is the magnificent reward to be won by the successful architect, namely, five hundred dollars and a city lot. The premium was awarded to an amateur, Dr. William Thornton, a native of the West Indies and an intimate friend of Thomas Jefferson's. The honor of furnishing the original drawing of the elevation was claimed by Hallet, who was a pupil of John Nash, a celebrated London architect, and it seems that the committee had accepted Hallet's plans and drawings, and employed him as supervising architect, but a peremptory order was given to adopt Thornton's plan, but still retain Hallet as architect. In the same paper appears a second advertisement which reads as follows:

A PREMIUM

Of FIVE HUNDRED DOLLARS or a MEDAL of that value at the option of the party, will be given by the Commissioners of the Federal Buildings to the person who before the fifteenth of July next shall produce to them the most approved plan, if adopted by them, for a PRESIDENT'S HOUSE to be erected in this City. The site of the building, if the artist will attend to it, will of course influence the aspect and outline of his plan, and its destination will point out to him the number, size and distribution of the apartments. It will be a recommendation of any plan, if the central part of it may be detached and erected for the present with the appearance of a complete whole, and be capable of admitting the adjoining parts in future, if they shall be wanting. Drawings will be expected of the ground plats, elevations of each front, and sections through the buildings in such directions as may be necessary to explain the internal structure, and an estimate of the cubic feet of brick work composing the whole mass of the wall.

March 14, 1792. The COMMISSIONERS.

The successful architect in this competition was more fortunate, for he received five hundred dollars without a city lot.

X. Y. Z.

"THE LIGHTING OF TOILET-ROOMS."

Chicago, December 3, 1906.

To the Editors of The American Architect:

Dear Sirs:—In a recent issue[2] of The American Aachitect there appeared an article on the above subject. The author, after making a reference to a notable lack of uniformity in the requirements imposed by various cities which provide for the lighting of water-closet compartments through the operation of regulations and ordinances, states that "indeed it appears that where the phrase 'light and ventilation' is used its import has in the minds of the framers of these regulations very little reference to the adequate lighting of toilet compartments." The author of the article, aside from quoting the specifications for toilet-room ventilation as taken from a number of ordinances and making reference to the value of light as a disinfecting agent, and finally stating that it is necessary to construct all toilet-rooms, and especially such as are for any public use, with direct windows to the outer air, leaves his criticism of the light and ventilation in toilet-rooms resting upon the statement of the same without an attempt to show what is a proper amount of window-area for such rooms.

Whether it was purposed so or not, Sections 1719 and 1722 of the Chicago Municipal Code are made to appear in a false light on account of an important omission in Section 1722, which should have been quoted as follows:

"Section 1722. [Light and Ventilation.] All urinals, bath, or water-closet compartments hereafter constructed in any building shall be lighted and ventilated as hereinafter provided for. Every water-closet or urinal compartment or bath-room in every now-existing building, and every compartment in buildings hereafter erected, where the compartment is more than one story underground, shall be separately ventilated by a window opening to the external air or by proper and adequate ventilating pipes, shafts, or ducts running through the roof or to the external air, and providing for at least four changes of air for the entire compartment each hour. All such compartments shall be adequately lighted by either natural or artificial light."

This section has particular reference to water-closet compartment ventilation in existing structures and to compartments to be constructed upon some sub-basement or subway floor (thirty feet below street level). The first sentence of Section 1722 has reference to the specifications of Section 1724 as then quoted.

Attention was likewise called to the fact that the original plans for the Cook County Building, as originally drafted and placed on exhibition, had 40 per cent. of the toilet-rooms entirely dependent for their lighting upon artificial means. There is no criticism offered for this statement, and attention is called to it for the reason that one would be led to believe that such plans as drafted were passed in that form. A special permit covering the natural lighting of these toilet-rooms was issued April 14, 1906, containing the following specifications:

"Provision must be made for lighting inside toilet and bath rooms by fixed windows of an area equal to one-tenth of the floor area of the room and provided, further, that the air from these toilet and bath rooms is to be continuously changed by mechanical means exhausting the air therefrom at least four times each hour during the occupancy of the building."

An amendment was made to Section 274 of the Revised Code of Chicago, the same being pased October 22, 1906, which has reference to the ventilation of toilet-rooms in hotels, office-buildings, public buildings, etc. The amendment as pertaining to the lighting and ventilation of such toilet-rooms or compartments follows:

"Section 1. That Section 274 of the Revised Municipal Code of 1905 (Section 206 of the Building Ordinance) be and the same is hereby amended to read as follows:

"In all buildings of this class, the fire-escapes, stairs, stair-halls, entrance-halls, bay-windows, vent-shafts, courts, lights and halls, porches, windows and public halls, shall be of the size and dimensions as are prescribed in Sections 392, 400, 402, 404, 412, 415, 416, 417, 418, 419, 420, 421, 422 and 423, of this Chapter, relating to buildings of Class VI.

"Where vent-shafts, as defined in Section 389 of this ordinance, are used to ventilate water-closet compartments, bath-rooms, or pantries, of hotels, office-buildings, or club-houses, they shall be of the following dimensions:

Building.	Square Feet.	Least Width, Feet.
2 stories	22½	3
3 stories	27	3
4 stories	36	3
5 stories	48	3
6 stories	72	6
7 stories	96	8
8 stories	120	8

"In every hotel, office-building, or club-house, hereafter erected and every hotel, office-building, or club-house which shall be increased or diminished in size, or otherwise altered after its erection, and in every building, now or hereafter in existence, not now used as a hotel, office-building, or club-house, but hereafter constructed or altered to such use, and every habitable room, excepting water-closet compartments, bath-rooms and pantries, shall have at least one window opening directly upon a street, alley, yard, or court. The total area of the windows opening from any such room (other than water-closet compartments, bath-rooms and pantries), shall be, at least, one-tenth the floor-area of that room, and the top of, at least, one window shall be not less than seven feet above the floor, and the upper half of that window shall be made so as to open its full width. No window in any such room (other than pantries, water-closet compartments and bath-rooms) shall have less than ten square feet of glass area. Every such water-closet compartment, bath-room or pantry shall have a window not less than one foot wide and of an area of, at least, four square feet for a floor-area of forty-five square feet or less opening directly into the outer air, or special light or air-shafts, into which no other rooms, or compartments, other than toilet-compartments, bath-rooms, or pantries, are ventilated. For upwards of forty-five square feet of floor-area, there shall be a window-area, at least, one-tenth of the floor-area. The windows in all cases shall be arranged so as to admit of their being opened, at least one-half of their height. The urinal, bath or water-closet compartments on the top floor of any building may be lighted and ventilated by means of a skylight and ventilator. The area of the skylight shall conform to the above specified areas for windows. It is provided that in hotels, office-buildings and club-houses the bath-room, water-closet and urinal compartments may be ventilated by exhausting the air from the same at the rate of at least six complete changes of air from each room per hour by approved positive mechanical means to special air-ducts to the outer air. The special ventilating duct or ducts, together with their branches, shall be of such size or sizes as to provide for the required changes of air from each of such rooms. It shall be the duty of the owner, agent, architect, or of the party in possession or control of the same, to notify the Commissioner of Health in writing twenty-four hours in advance when any such

[1] The correspondent who is good enough to send us these interesting competition programmes evidently forgets that in 1792 the United States treasury was less well filled than it is to-day. Moreover, at that date, not only did the dollar have a somewhat higher purchasing power than it has to-day, but there were fewer opportunities and temptations for spending it.—Eds. American Architect.

[2] May 12, 1906.

system is completed, for the supervision of the test. When the installation of the mechanical ventilating system for toilet and bath rooms is complete, and the ventilating appliances are being operated at their normal capacities they shall be tested by the party notifying for test for volumetric efficiency in the presence of and under the direction of the Chief Sanitary Inspector of the Department of Health.

"The mechanical ventilating system shall at all times be kept in good repair and operation to insure the required ventilation during the hours when the above specified buildings are used for human occupancy.

"All such toilet or bath rooms as mentioned in this Section, shall have a fixed window, or windows, having a gross glass-area and equal to at least one-eighth of the floor-area of rooms. The windows are to be provided and placed in the dividing or enclosing partitions, and shall be suitably arranged so as to admit of natural light from an adjoining room which has direct communication to the outside air. All such rooms or compartments shall have proper means for artificially lighting the same, and they shall be properly and adequately lighted by natural or artificial means during the occupancy of the building."

"Section 2. This ordinance shall be enforced and in effect from and after its passage."

This amendment takes cognizance of the effect that where these buildings or halls are built in a down-town district, the giving up of such areas as one hundred and twenty square feet for vent-shaft with a least width of eight feet for the purpose of lighting and ventilating toilet-rooms, is appropriate and allows of the use of valuable floor-area for a purpose that can be met in another way. There is no doubt that the provision of this Section regarding all inside toilet-rooms having fixed window-areas of at least one-eighth of the floor-area of said room through which light may pass from an adjoining properly lighted room gives a condition of light which is equal to that obtained from any such a vent-shaft as mentioned. There is also better provision made for ventilating such rooms, by requiring six complete changes of air per hour by some positive mechanical arrangement, the efficiency of which is to be determined after the same is working at its normal capacity. All of these sections with reference to the lighting of toilet-rooms contain specifications which best meet the conditions existing in old and new buildings. While outside light is always desirable, yet there are toilet-rooms located in such positions in old buildings at the present time that such light cannot be made to reach them. They are also beyond the provisions of legislation requiring their relocation. Therefore, the next best thing is to provide adequate ventilation for them.

In buildings not over eight stories in height where the toilet-room is dependent upon a vent-shaft for its light, the provisions as quoted having the glass-area dependent upon floor-area are equal of any that have been presented. Having the glass-area of a toilet-room dependent upon the floor-area of the same is, in my judgment, a wise provision for the reason that if a toilet-room has a floor-area of forty-five square feet, the amount of window-area is at once secured, no matter how many toilet fixtures are placed within the room, while if the amount of glass-area is dependent upon the number of fixtures placed the difficulty will be encountered of securing additional window-area when fixtures are added at a later time.

PERRY L. HEDRICK,
Chief Sanitary Inspector.

ILLUSTRATIONS

SHELBY COUNTY COURT-HOUSE, MEMPHIS, TENN. MESSRS. HALE & ROGERS, ARCHITECTS, NEW YORK, N. Y.: SIX PLATES.

COMPETITIVE DESIGN FOR THE FIRST BAPTIST CHURCH, MELROSE, MASS. MR. C. H. BLACKALL, ARCHITECT, BOSTON, MASS.

Additional Illustrations in the International Edition.

ENTRANCE TO THE BINNENHOF, THE HAGUE, AND A GATEWAY AT AMSTERDAM, HOLLAND.

THE MARKET PLACE AND FISH POND, THE HAGUE, HOLLAND.

HOUSE ON THE KAIZERGRACHT, AMSTERDAM, HOLLAND.

THE GEMEENTELANDSHUIS, DELFT, HOLLAND.

In this palace, now a barrack, William the Silent was assassinated by Balthazar Gerad, in 1584.

NOTES AND CLIPPING

UNIVERSITY OF ILLINOIS ARCHITECTURAL DEPARTMENT.—The architectural department in the University of Illinois has recently installed one of the best projection lanterns yet made. It is of German manufacture, and of such a nature that an entire page of a book may be thrown upon the screen, without the necessity of making slides; color and color effects may also be illustrated; 1,500 lantern-slides have recently been added to the already large collection. The departmental equipment has been further increased by the purchase of about $2,000 worth of books, which have been added to the Architectural Library, so that the library now offers almost unequaled advantages not only for undergraduate, but also for graduate and for advanced work in architecture and architectural research. This department, like the others in the College of Engineering, is closely allied to the Experiment Station. Experiments have been made upon the strength of wooden beams and upon spliced wooden tie-beams. Arrangements have been made to carry on and to supplement the results of these experiments. Investigation will also be made upon both plain and ribbed cast-iron base plates, and formulas for both deduced.—*University of Illinois Bulletin.*

RECLAIMING LAND AT KANSAS CITY.—Along the river front of Kansas City are 350 acres of level, drifting sand. The sand is from 20 to 50 feet deep all over the 350 acres. There are millions of tons of sand there, and every grain of it was pumped from the bottom of the Missouri River. There are two boats which work day and night pumping sand upon the land that is being reclaimed from the river. From the pump upon the boat the sand and water is forced through a long iron pipe and is discharged upon the land. In this way the 350 acres has been reclaimed from the river. The land is owned by the Armour-Swift interests. It is worth $30,000 an acre now.

The water of the Missouri River where it flows past Kansas City averages 20 feet in depth and the current is very swift. Anchored 100 feet from the shore are the pump boats and sand barges. They have powerful engines and pumps and long steel pipes that are lowered to the bottom of the river. The nozzle of the pipe sinks into the sand and the pump sucks it up. The sand that is sold for building purposes runs out into a scow. The sand fills the scow, the water rising and running over the edges until the scow is full of sand. Then the barge is towed to the bank, a system of buckets upon an endless belt running up a long crane scoops the sand out, carries it up, and dumps it in a pile upon shore, where wagons can get at it. For years and years, day and night, the pumps have been steadily sucking up sand from the river bottom. But the quantity never lessens. There is always a mass of it rolling and drifting slowly onward, and the current quickly fills up the depression made by the pump nozzle. Beneath the sand is a deposit of "gumbo" or hard clay, beneath that is a blue shale, and next to that is the bed-rock. The piers of the Winner Bridge go through from 90 to 125 feet of sand and soil before they reach bed-rock. There is more of each of the piers below ground than there is above.—*Kansas City Star.*

TRACK ELEVATION IN CHICAGO.—"Trackage to the length of about 600 miles will have been elevated at an aggregate cost of about $40,000,000 to the railways entering Chicago before work ceases this fall," says *The Railway and Engineering Review.* "Of that expenditure, about $6,000,000 represents that spent on work this year. The number of miles of single track elevated this year will reach fifty, of which ten miles will consist of main line. The most difficult of all the track-elevation work is being done this year. This means that track-elevation plans in Chicago are fast nearing completion. Only about 150 miles of track, or one-fifth the total, remain in the city to be raised above the level of the streets. The cost will approximate $11,000,000. At the rate the work has moved this year, the entire task could be completed within two years so far as engineering conditions are concerned."

INDIRECT ILLUMINATION OF SCHOOLS.—Experiments were recently made in Munich to determine the cost and relative advantages of indirect illumination for school and draughting rooms. The arc-lamp was found to give the best results, but intensifying gas-burners more economical. This method of lighting has been strongly recommended to the school authorities.—*Electrotechnik und Maschinenbau.*