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THE appropriation for the Paris Exhibition once secured, and the commission organized, there seems to have been a commendable promptness in getting to work. Two government ships, the famous *Constitution* and the *Supply*, are announced as loaded and ready to sail for Havre with American contributions: they will probably be at sea before this paper reaches our subscribers. The narrowness of the space left for us in the exhibition building at this late day, and the quantity of things offered to fill it, have obliged Commissioner McCormick to build an annex, at the charge of the Congressional allowance. This will take a piece from the slender appropriation, and the increased cost of guarding it another: an additional example of how delay, as well as haste, makes waste. We already hear that the Government has found it necessary to detail two additional vessels, — the *Wyoming* and the *Portsmouth*, — and may be thankful for the interest that this indicates; but we suspect that a good deal may still be done to accommodate things to their places, by restraining the exuberance of those who exhibit bulky articles or collections. Most people will remember the fatiguing impression made upon visitors to the Centennial, especially in the Agricultural Hall, by enormous ranges of similar articles where two or three specimens would have sufficed, or by huge models where small ones would have been better. We read that a lumber-dealer of Philadelphia has constructed a great trophy out of forty-three different kinds of native woods. The trophy occupies eight by twelve feet of space, and we may hope that its merit of design and execution justifies its size; but that can scarcely be the case with a contribution which is expected from California. This is a pyramid twenty feet square and seventy high, gilded we presume, which is to represent the cubic volume of gold thus far taken from the mines in California. To it are to be added five hundred tons of various minerals as specimens, — the cargo of a ship, as ships used to be built not so very long ago. It may be assumed that this gigantic contribution, if it gets to the Exhibition, will find its way to the annex above mentioned. It is a pity that there is not somebody to remind the people of California that, even in Paris, exhibition-buildings are not made on the scale of the Rocky Mountains and Pacific farms, and that in an exhibition of industrial art, skill and not bulk is the desideratum. However, the seventy-foot pyramid is doubtless hollow; and if room is scant, the five hundred tons of minerals, after reserving sufficient specimens, may be safely stored under it, and perhaps still leave room for other things that it may be desirable to get out of the way.

MR. THOMAS BRASSEY, M.P., well known in England for his interest in questions of labor and for his writings upon them, has lately read a paper at the Royal Institute of British Architects, in which he gave a systematic account of the change in the wages and condition of workmen in the building-trades during a generation past. He finds that the aver-

age increase in wages since 1853, making allowance for the diminished hours of work, is 44 per cent; and the actual increase per day or hour in ten years from 1865 to 1875 ranged in the different trades from 17½ to 35 per cent, the least gain being that of the plumbers, and the greatest that of the common laborers, while the general rise in most of the trades was about twenty per cent. Up to 1853 the uniform rate of wages among the trades had been for a long time five shillings per day. Then set in a gradual rise accompanied by a reduction of hours, which led the masters in 1861 to introduce the system of payment by the hour, after which the rates of the different trades began to diverge. The reduction of hours had indeed begun somewhat earlier than the increase of wages; and between 1847 and 1877 the rate, which had amounted to thirty shillings per week for sixty hours work, grew to an average of 39s. 4½d. for fifty-two and a half hours work, which is equivalent to the advance mentioned above of 44 per cent. If the only change had been in the time and the wages, this might not have increased the cost of building in any thing like the same ratio; for, owing to the introduction of machinery and improved processes, the price of most building-materials has been kept down to a comparatively small rise, and brick has even diminished in cost by about twenty per cent, while in many respects the efficiency of labor on the materials has been increased, — as by hoisting-machines, mortar-mills, machines for dressing wood and stone, etc., — but these improvements have been so far offset by the deterioration of the workmen and their slackness in working that the cost of building has increased from 20 to 30 per cent. As a striking example, Mr. Brassey quoted the cost of brickwork lately built by Messrs. Lucas for the North-Eastern Railway Company. The labor on this work would have cost at old rates 38 shillings per rod; adding 50 per cent for increase of wages, it would have been 57 shillings; and they contracted for it at 63 shillings. It actually cost more than five pounds per rod, — a loss to the contractors of 55 per cent on their estimate.

Of course these figures do not represent so much actual gain in the condition of the workmen, nor so much loss in that of the owners of buildings. A good part of it is to be set down to the depreciation of money: how much, it is not so easy to say among the continually shifting ratios of the prices of all kinds of articles. The cost of living has risen meanwhile very considerably, though hardly in the same degree; for the better class of workmen and their families, while they work less, live in greater comfort than before. The laborers, on the other hand, have not gained in equal proportion, though their wages have risen more; and the inference is, that they spend a greater proportion of their earnings in idle or mischievous ways. Mr. Brassey is inclined to think that the efforts of the trades-unions have had little effect in the rise of wages, which he considers to be a mere matter of supply and demand. As regards the broad general movement, extending over a generation, in which wages have kept pace with other things, he is probably right. But this is not the thing which is most troublesome. It is not a high or low scale of general prices, which only means the greater or less purchasing power of money, nor a steady movement in the price of one kind of goods or labor, — it is the uncertainty and fluctuation of prices, which upset the solid prosperity of a community. For this uncertainty and fluctuation in the building-trades and other industries, the unions, more than any thing else, are responsible. And the deterioration of the workmen, the levelling down of the accepted standard to the performance of the poorer artisan, the diminution of the quantity and quality of work performed in a given time, are mainly to be charged to them, we believe, for they are among their special aims. Mr. Brassey's remedy for the disorder into which labor has fallen, is a system of piece-work, or else of "set-work," — a term with which we are not familiar, but which we understand to imply an agreement with a body of workmen to perform a given amount of work for a given price. We are inclined to believe that the hope of the immediate future lies in some such resource.

The Crispin strike in Massachusetts is practically ended; the men having yielded, first in Lynn and then in Beverly, to the principal demands of the masters. The board of arbitration of the Order, which assumed to control the field, refused to give up its position. But the persistent rejection of their interference by the masters proved too strong for them, and in one manufactory after another the men made their terms independently with their employers; generally going to work at the rates offered them, except where their places had been occupied by outsiders, who in most cases were retained. We find in the *Boston Advertiser* a list of twenty-five firms in Lynn who held their position through the strike. They employed in all 2,560 men, of whom 2,214 were thrown out of work, 2,100 of them being actual Crispins, or participants with them. The average wages, says the *Advertiser*, were \$14.05 per week, which gives a weekly loss in wages to the strikers of \$29,505, — or, since the average duration of the strikes was six weeks, in all \$177,030. Six hundred and fifty new hands were taken on during the strike, and their places are lost to the old men. It is believed that the strength of the Crispins is broken by their failure in this quarrel; certainly one would think that their resources might be. The cost to the community of Lynn is of course much more than the mere loss of wages. The labor troubles and the depressions of business have reduced the weekly draft upon the banks for pay-rolls by about \$45,000 below that of the same season last year. One manufacturing firm has been absolutely driven from the city, and four others have established branch factories elsewhere, to which their real business may be transferred if troubles recur.

The jury which has held its inquest on the Tariffville bridge disaster has been unable to agree; but eight of the twelve have united in a report that will win a substantial approval. They find no evidence that the bridge had been meddled with ("tampered" is the accepted word), nor that the train left the track. They dispose of one foolish apology by saying that "running two engines together when deemed necessary is not at all censurable," and by quoting the words of one witness, that "any bridge that would not carry two locomotives ought not to carry one." They think that if the bridge was originally what it ought to have been, to which they do not commit themselves, it had deteriorated through neglect, exposure, or overstraining, till it was dangerously defective, both timber and iron becoming unfit for their duty. They lay the responsibility on the directors of the Connecticut Western Railroad, and "present and declare that in the construction and management of railways it is time to take a new departure: that in their construction the eternal principles of nature should not be violated; and that in their management all, from the highest official to the lowest operative, should at all times be held to a strict accountability." We believe, after reading the published testimony brought out during the inquest, that all these declarations accord strictly with the facts and with reason, and we rejoice to see them made in this honorably uncompromising way, without fear or favor. We can only hope that the people of Connecticut may henceforth find some way of bringing home the responsibility of such disasters to those whose duty it is to prevent them. One could have wished that the jury had gone one step further, and added to their report that the bridge was not so constructed as in its best estate to be safe under the load that was put upon it. It is said that a bridge at Saybrook, not far off, is of substantially the same construction as the fallen one, and then it is only a matter of chance how long it stands. The foolhardiness of ordinary constructors is at least as perilous to the community as the recklessness of directors and superintendents. So long as we find engineers and other so-called experts reckoning on a factor of safety of two as the correct thing, or wondering why bridges and other structures do not bear all the strain which their materials endure under test, so long we may expect to see their constructions tumbling to pieces and killing our fellow-citizens, — unless we are ourselves so unfortunate as to be on or under them.

We have to add to our dismal record the fall of some unfinished houses in New York, by which two men were severely injured, and perhaps killed. A block of dwelling-houses,

of brick with stone fronts, is building on Lexington Avenue, and had been carried up to the third floor. The morning after the violent rain-storm of last week, the workmen, on coming to their work, found that the earth under the rear wall of one of them had been washed away, and that the wall had fallen. The men had scarcely set to work, and one of them was still busy plumbing the walls of the adjoining house, when that too fell in a heap, burying him and another. No sufficient cause has yet been declared for the fall, but some opinion may be formed from the facts that these houses of brick with brown-stone fronts, of three stories and a basement, were to be built for eight thousand dollars each, and that according to a report of the specification the "girders" of the first floor were to be six by eight inches. The contractor, as is natural, insisted that the work and materials were the best, and could not imagine why they did not stand. He could only suppose that the freshly-laid masonry had been softened by the storm, which, as he agreed with the inspector of buildings, was responsible for the damage. Yet people who build houses in the winter must expect to have them rained on; and most persons would probably agree that a house which was liable to be beaten down by a heavy rain while it was building was not one that they would care to live in when it was finished.

The school-authorities of St. Louis have invented a new illustration of the dangers which beset children crowded into public schools. Some time ago the superintendent gave notice to the principal of the Devoll school to put his scholars under such discipline that they could all be got out of the building in two minutes or less. The principal accordingly arranged a sort of fire-alarm drill, as the chiefs of a fire police do, or the captains of Cunard steamers, and directed the children, whenever certain strokes of the gong were sounded, to hasten out of school at a half-run. The first day's rehearsal went off successfully enough; but the second time the alarm was given, the children made too much haste, and two of them were thrown down, trampled upon, and considerably hurt. A praiseworthy object seems here to have been sought in a most indiscreet manner. It is haste in getting out that leads to almost all the danger when crowded buildings take fire; and the thing to do by way of precaution would be not to teach the children to scramble out in a hurry, but to make them walk out as deliberately as possible. It is safe to say that when the exits are not cut off there is always time to clear a burning building, provided it is done leisurely; but none to clear away a fallen crowd. The people of St. Louis have, on the whole, got their lesson at a moderate cost to the children on whom they tried their experiment, at least in comparison with those of a city in Iowa, quoted by the *Globe-Democrat*, where an experimental alarm was sprung from without upon a school-full of children, with the result of killing two or three and maiming many. It may be hoped that something will be learned from it besides the necessity of discretion in their drills. Eight hundred children were hived in this one schoolhouse, three or four times as many as ought ever, in our judgment, to be allowed in one such building, notwithstanding the common habit in this respect, — unless, indeed, the building is so subdivided by fire-walls, and so provided with exits, as to be equivalent to two or to several buildings. As for getting so many out in a hurry, eight hundred equals the effective number of a regiment of soldiers, and we should be satisfied to know that a well-drilled regiment of that strength, distributed in the twelve rooms of a schoolhouse, had been got out in two minutes under a sudden alarm.

In our report of the last day's session of the Institute Convention, printed last week, Mr. Peabody is said to have read a paper on Colonial Architecture, prepared by Mr. McKim. This is an error of the stenographer. Mr. Peabody read a paper of his own, in place of one that was expected from Mr. McKim. It was printed in the *American Architect* of Oct. 20, 1877.

THE ROMAN FORUM. — The *Academy* says the Minister of Public Instruction has ordered a re-commencement of the excavations in the Forum Romanum. The whole area as far as the Arch of Titus is to be uncovered, and the front of the Forum connected with the remains of the Palace of the Cæsars.

THE FIRE QUESTION.

[Read at the Eleventh Annual Convention of the American Institute of Architects by P. B. Wight, F.A.I.A.]

In my first paper on the fire question, prepared for the Eighth Annual Convention, which was not read, but subsequently published in the *American Architect*,¹ the subject of prevention was outlined under two heads. The first, comprising the class of so-called fire-proof buildings, was not considered in detail. The second, relating to systems of what may be called for convenience "partial fire-proofing" and absolute exterior protection, was discussed at considerable length.

To resume the consideration of the first class, I will quote a few sentences in which it was referred to. After venturing the opinion that we were not likely ever to see a city entirely composed of fire-resisting structures, I said, —

"If, then, each new building cannot be a component part of a city wholly fire-proof, I submit to your candid judgment whether you do not take a fearful responsibility when you recommend the erection of a building wholly of incombustible, and consequently very expensive materials, which is to stand for years in the midst of others of a decidedly combustible character. Experience has shown that such a structure must be a veritable fortress against fire; and this is the case in few buildings I know of erected according to systems in use five years ago."

Also the following: —

"The most valuable buildings that have recently been erected in our large cities are entirely unprotected on the exterior, reliance being placed upon the *incombustible* nature of the materials in them. They are in no sense fire-proof when standing among combustible buildings."

First-class fire-proof buildings were described as those (I quote) "wherein the matter of cost is not an element to weigh against the use of any building-material or method of construction, so long as it is non-combustible, indestructible by time and the weather, and fire-resisting." . . . "In their construction the highest scientific and artistic attainments will always be brought in play. It will always be a matter of great concern how to make them secure against every contingency of fire, whether from inside or outside."

It is but a few years since it was the generally accepted opinion that an incombustible building was fire-proof. And by an incombustible building I do not mean one simply constructed with iron beams and the heretofore-employed materials for bridging the spaces between them, and otherwise finished like those previously constructed inside of wood; but one in which the materials throughout, except perhaps doors and floors — which convenience demands shall be of wood — cannot burn. But experience has demonstrated that such structures, though they will not *burn*, may still be *destroyed*. The new problem that confronts us therefore is, how to preserve the materials of construction from the effects of fire. It will not do to say that your house is fire-proof because there is nothing in it to burn. Houses are built for use. You cannot prevent people from putting combustibles into them. Perhaps they are built for offices; but who is to say how much furniture the tenants are to use? You cannot put up buildings for show, and then lay the blame upon the occupants if they are destroyed by fire. Take the case of office-buildings. Under severe scrutiny the accumulation of combustibles in them may be curtailed; but in the course of time other tenants come in, or the buildings are diverted to other uses. Consider the inflammable nature of a well-stocked and somewhat cramped architect's office. Look at the accumulation of cases and books in lawyers' offices, and see our public buildings stored with cases and documents often from floor to ceiling. A tenant may take two rooms, using only one of them for business. The other often becomes a storehouse; and so gradually that the owner is not likely to detect the illegitimate use made of it. Then the upper floors are often used for manufacturing which can only be carried on in such structures, such as engraving or lithographing, with their accumulations of combustible materials in places not easily reached by water. Many offices are filled with sample-cases from floor to ceiling, and drawers filled to repletion. I am not supposing that the fire originates in one of these rooms, where it might be quickly stamped out, as was the case lately in the Palmer House in Chicago. But suppose it starts among some boxes accumulated in a basement, perhaps only left there temporarily to be removed in the morning. In the stillness of the night the fire creeps up a stairway or an unprotected elevator, and communicates with a suite of such offices as I have enumerated above, with wooden doors and open transom-lights, and doors standing open between the rooms. Before succor comes a whole floor is in flames, and the incombustible yet unprotected materials of construction are in danger. Or, suppose a fire rages on the opposite side of a narrow street, and the wind sweeps the flames into the windows of a number of such rooms simultaneously; the same results will follow.

The sad experience of a few years has shown that the most treacherous and dangerous of these materials of construction is *iron*, the very mainstay and *shibboleth* of fire-proof constructions of ten years ago, and of some at the present time.

As regards floors, there is no instance in which the filling

between iron beams has failed before the beams themselves; yet we have been discussing over and over again the various methods of doing this part of the work most effectually, when the vulnerable part has had no consideration. We have plastered the under sides of brick arches, and run elegant mouldings on the iron beams, which mouldings we have had as much as we could do to make stay in place at ordinary times. Some have called this fire-proofing; but a good fire will bring down these plaster mouldings in a few minutes, because they expand and crack, being heavier and thicker than the other plaster, and have adherence only at the edges. We have suspended ceilings beneath the beams and arches, putting an ordinary and cheap coat of plastering on an expensive structure of iron. This is much better. We have here the advantage of a confined air-space between the structure and ceiling. Still the plaster is thin; and if it absorbs enough heat to expand the lathing, by which process it bulges out in places, away goes the plaster, and the laths are of no account as protection to the beams. We have suspended sectional slabs of incombustible and non-conducting materials under the beams and arches at still greater expense, and with the addition of greater weights. This is better still; but it is a double process. What we want is a simple one, which will give a groundwork for the ceiling, and support for the floor, by one operation, and at the same time obviate the necessity of filling up dead space to get up to the proper floor level. Combined with this we want a positive protection for the beams, enveloping them on all sides.

Thus far I think only three methods of constructing really fire-proof floors have been employed. The first is where a flat arch of non-conducting and incombustible material has been sprung between the lower flanges of the beams, the lower surface of the arch being below the bottoms of the beams. When the blocks fit well, and the edges next to the beams slightly cover them, the space between opposite blocks has the form of a dove tail, so that cement filled in for the protection of the beams can never be dislodged. This method is the one employed by the fire-proof building companies of New York and Baltimore, and by other constructors as well; the variations of different manufacturers being in the forms and materials of the blocks employed. With all these methods the ceilings are flat.

The second method is that employed by Mr. William Ward in the construction of his private residence at Portchester, N.Y. It has been fully described in the *American Architect and Building News*¹; it is therefore unnecessary for me to describe it in detail. As briefly as possible I will say that it is a modification of the French system; but uses Portland cement and sand, instead of plaster and cinders. The beams are incased in a body of concrete, which is first allowed to harden. Ledges are left on the sides of this incasing concrete. At the level of these ledges is set a flat centring, on which is spread one inch of concrete. Then three-eighths inch iron rods are laid from beam to beam a few inches apart; then an inch of concrete; then iron rods crossing those previously laid; then one or two inches of concrete. The incased beams show below the ceiling, and the concrete in the spaces between them forms one homogeneous body with the concrete incasing the beams. Experiments have demonstrated that with this system of fire-proofing fully one-half of the iron usually employed in beams may be dispensed with, and that the formulas generally used for determining the depth and spacing of the beams do not apply in such cases. What formula can be used for them has not yet been determined.

The third method of floor-construction is that employed in the Mitchell Building at Milwaukee, and devised by Mr. Loring; the building being designed by Mr. Mix, architect. The beams are incased with porous terra-cotta, there being one block on each side; the two meeting at the under side of the beams. These are set with gauged mortar. They form skewbacks. Barrel-arches are not employed; but at intervals of very nearly two and one-half feet, solid segmental brick arches are sprung across from beam to beam, the same as would be employed over an opening in an eight-inch wall. This leaves a series of open squares. The brick arches are connected by slabs of hard terra-cotta of cellular form, two feet long, one foot wide, and two inches thick each. The ceiling shows the incased iron beams one way, the segment arches the opposite way, and the panels of hard terra-cotta in the interstices. The surfaces of all the parts are rough enough to receive plastering. This has the advantage of being the lightest construction yet employed when iron beams are used.

For girder protection the case is similar to that of a beam. The girder, however, is often exposed on the sides as well as the bottom, and needs more careful protection as it is more exposed. We find many buildings in which the girders are wholly unprotected. This is the case in the largest jewelry-house in New York. In most instances the girders are either incased with wooden furring and laths, plastered in the ordinary way, or with iron laths similarly plastered. These, as far as protection goes, are quite as imperfect as the same process applied to ceilings. I have been informed that in some buildings girders have been enclosed with flat slabs of non-conducting and incombustible material. I do not know of any in which they have been buried in a solid envelope of non-

¹ See *American Architect and Building News*, vol. i., pp. 195, 203, 211.

¹ See vol. ii., p. 265.

conducting and incombustible material, except the Mitchell Building at Milwaukee. For this porous terra-cotta blocks have been cast to nearly fit the beams forming the girder, the blocks having straight exterior lines. The slab forming the bottom is bedded up against the girders, and the side pieces hold it after the manner of a dove-tail. The side pieces have bearings on the bottom flanges of the beams forming the girder. The whole is held together in a solid mass by the gauged mortar in which the terra-cotta is set, which fills all the interstices between the girder and the porous body. Plastering is applied directly to the porous body. There is a wide range of materials which can thus be applied to the protection of girders, varying however in non-conducting properties and weight.

In the older government buildings, isolated supports such as pillars and columns were either of brick, stone, or marble. These were used indiscriminately, on the supposition that they were incombustible and consequently fire-proof. Stone and marble seem only to have been used in preference to brick where richness of effect and a slight decrease of dimensions was sought. It is needless for me to call your attention to the imperfections of stone, granite, or marble as materials to resist fire in the interior of a structure. Where the room can be spared and sufficient strength obtained, brick will ever remain one of the most efficient fire-resisting supports. It is weakened in this respect, however, by the insertion of stone, marble, or granite bands. Where such are necessary, plates of cast or wrought iron should be employed. They may be very thin, and the amount of heat absorbed by them can do no harm. Iron bands are useless to prevent the crushing of brick piers or arresting its progress, especially when the loads are central.

Thirty years ago cast-iron came into use for isolated supports, the first columns having been imported from Scotland. They may now be seen at the corner of John and Pearl Streets, New York. Strange to say, all the columns then imported were not used at that time, but twenty years after were employed in another building. The use of cast-iron for columns is now almost universal, and many in our profession have made their first concessions of their sense of architectural propriety to practical convenience in using them for fire-proof structures. It is not many years since the danger to be apprehended in the use of iron for columns, whether cast or wrought, became apparent. It seems to have been perceived in England before it was in this country. A cast-iron column expands considerably before it becomes sufficiently heated to be materially weakened. The expansion is very nearly one-twelfth of an inch to a foot, or one inch in twelve feet. It forces the superimposed load upward, and thus not only lifts the work, but is resisted by all the rigidity of the work; this brings a strain on it that it was not calculated to bear, and it breaks as soon as it is softened in the least. It would stand a greater heat with safety if the load was not thus increased. If water is thrown on it the nearest side contracts; it bends, and the load, bearing on a curved support, breaks it, no matter what the co-efficient of safety may be. It does not fly to pieces, as some suppose, on account of the action of water alone. It snaps off on account of the weight, even if moderately heated. If heated to the softening point, which is very nearly the melting point, it flattens and bends over. I have seen many of them with one end entirely melted off. It will thus be seen that it is not only necessary to prevent columns from melting, but to keep them from expanding. The expansion is a greater element of weakness in columns than in any other part of a building. England was first awakened to the necessity of protecting iron columns by the destruction of the Pantechnicon, a supposed fire-proof building, which contained many of them. The necessity for protecting them in fire-proof buildings of all classes became apparent to the writer on seeing the destruction of the Chicago Custom House in 1871, due alone to the weakness of the iron columns on the first story. I had occasion to give some account of the destruction of this building, in this very place, six years ago.

Dennet was the first to propose a method of protecting cylindrical cast-iron columns. He surrounded them with two and one-half inches of Portland cement, which was plastered around the columns after they had been wound with spirals of iron wire. This increased their diameters five inches, and made them quite bulky. He tried some interesting experiments with actual fire; placed thermometers inside, and suspended fine strips of lead in them, to show that they would not melt. A double iron column has been used in New York for some years. The space between the cylinders is filled with plaster Paris. An iron-contractor told me that they were liable to burst in frosty weather, and consequently they put in the plaster in a dry powdered state. In case of the destruction of the outer shell by fire, which is most likely, the dry plaster is liable to fall out, and the supporting column becomes exposed. These columns are heavy and expensive. The method of combining iron with a non-conducting and incombustible material, calculated to resist heat, and at the same time receive an incombustible covering having a superior exterior finish to that of iron, invented by my then partner and myself a few years since, was the result of our observations of the effects of fire on the old Chicago Custom House. This is too well known to require extended description in this paper. It has been employed in the

Mitchell Building before mentioned. The various methods described are the only ones known to have been employed up to the present time for the protection of floors, girders, and columns.

Partitions, if required to be light and otherwise than of common brick, do not present the difficulties which surround the architect in considering the floor question. Many materials useless for floors may be good for partitions. Of those not generally known to the profession, but worthy of notice, may be mentioned that of James John of Chicago, and such as was employed by Mr. Ward in his house at Portchester. Mr. John strings heavy wires (about No. 10) from floor to ceiling four inches apart, and sets up boards one inch from the wire-work. He then throws gauged mortar against the boards until it is two inches thick, thus leaving the wires in the centre. He levels his work off, removes the boards, and thus gets a solid partition of two inches. Mr. Ward made similar partitions of the same thickness by setting up three-eighths inch iron rods, and filling in with Portland cement concrete in the same manner. Besides these materials porous terra-cotta bricks, as employed in the Mitchell Building, hollow bricks, or any of the manufactured building blocks containing hydraulic lime, make reliable partitions four inches or more in thickness, and not requiring any extraneous stiffening.

Roof-construction does not need consideration here, because the problem is the same as floor-construction. Iron truss work for roofs must receive as careful attention as girders or columns. It is well to remember that the trusses of the Patent Office roof were entirely made of iron.

With regard to the aspects of the fire question from the point of view of fine art, a new field for thought must be traversed. If we cannot reconcile these new methods to our preconceived ideas of artistic propriety, it seems to me that in the present exigency we would be recreant to the evident demands of necessity, were we to sacrifice the former or attempt any compromise with the latter. The present state of affairs only shows that the problem of fire-proof building is not yet fully solved in all its aspects. The student of art has a new problem before him. The reconciliation must come when we know more than we now do. It would be foreign to the purposes of the present discussion to make any suggestions bearing upon it. It concerns us now to be alive to the necessities of the moment; to avoid all methods of fire-proofing which have failed to stand tests whether experimental or drawn from experience; to avoid expending our clients' money on methods of building which only hold forth false promises to those who confide in us; to consider diligently the contingencies of danger which may arise in every case; and to carry on scientific investigation until the end demanded is accomplished. It will not do to say that the case is hopeless. The world will only laugh at us if we do. We may expect to hear such things from the unlearned, but opinions from such sources will not have the weight which attaches to the dicta of scientific investigators.

THE ILLUSTRATIONS.

THE ORIENT MUTUAL INSURANCE COMPANY'S BUILDING, NEW YORK, N.Y. MR. A. H. THORP, ARCHITECT.

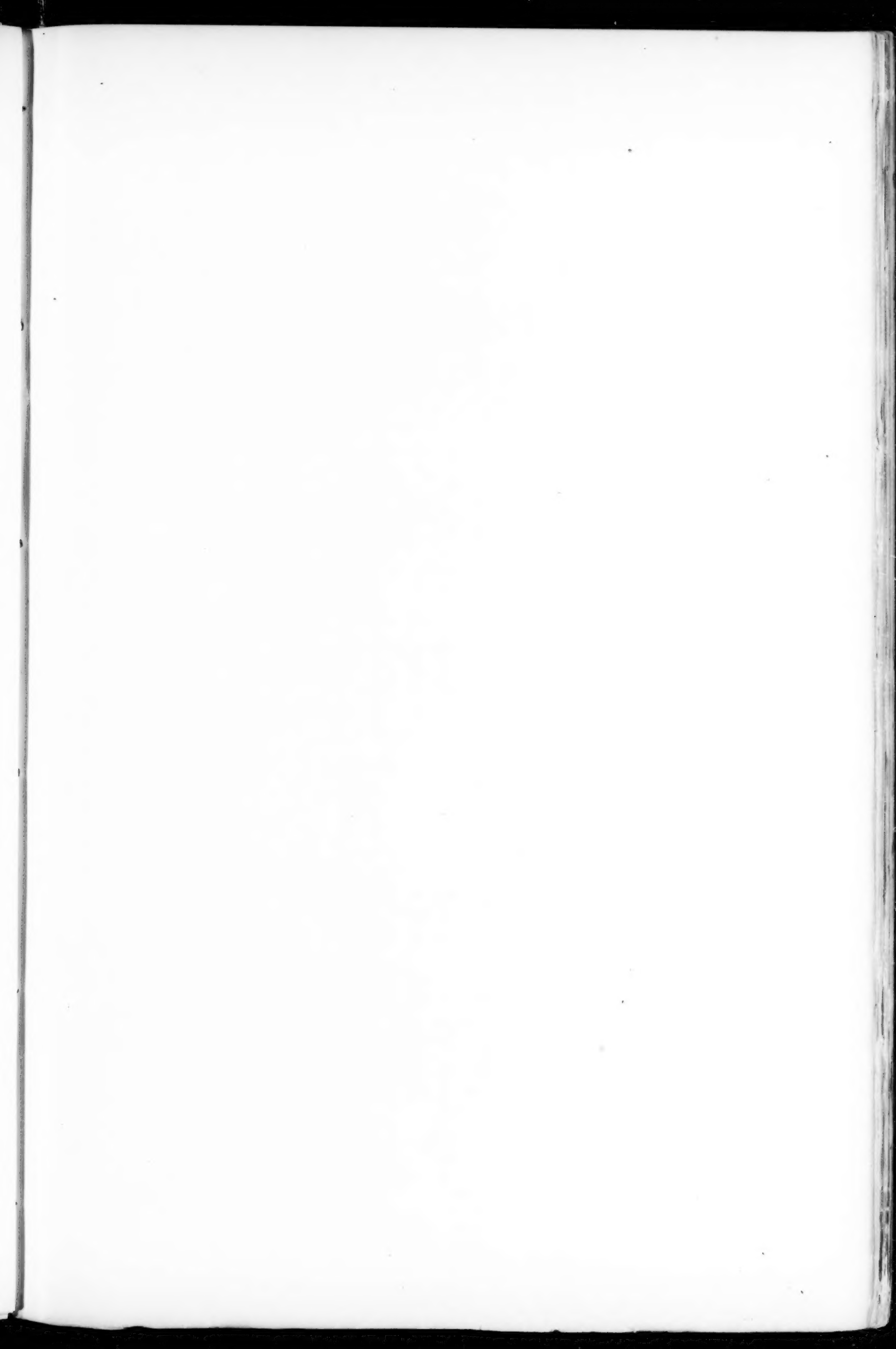
This building, which is now nearly finished, occupies the upper half of the Juncey Court estate on Wall Street; it is built of white marble. The other half of the lot is occupied by the building of the Queen's Insurance Company. (See *American Architect and Building News* for Sept. 29, 1877.)

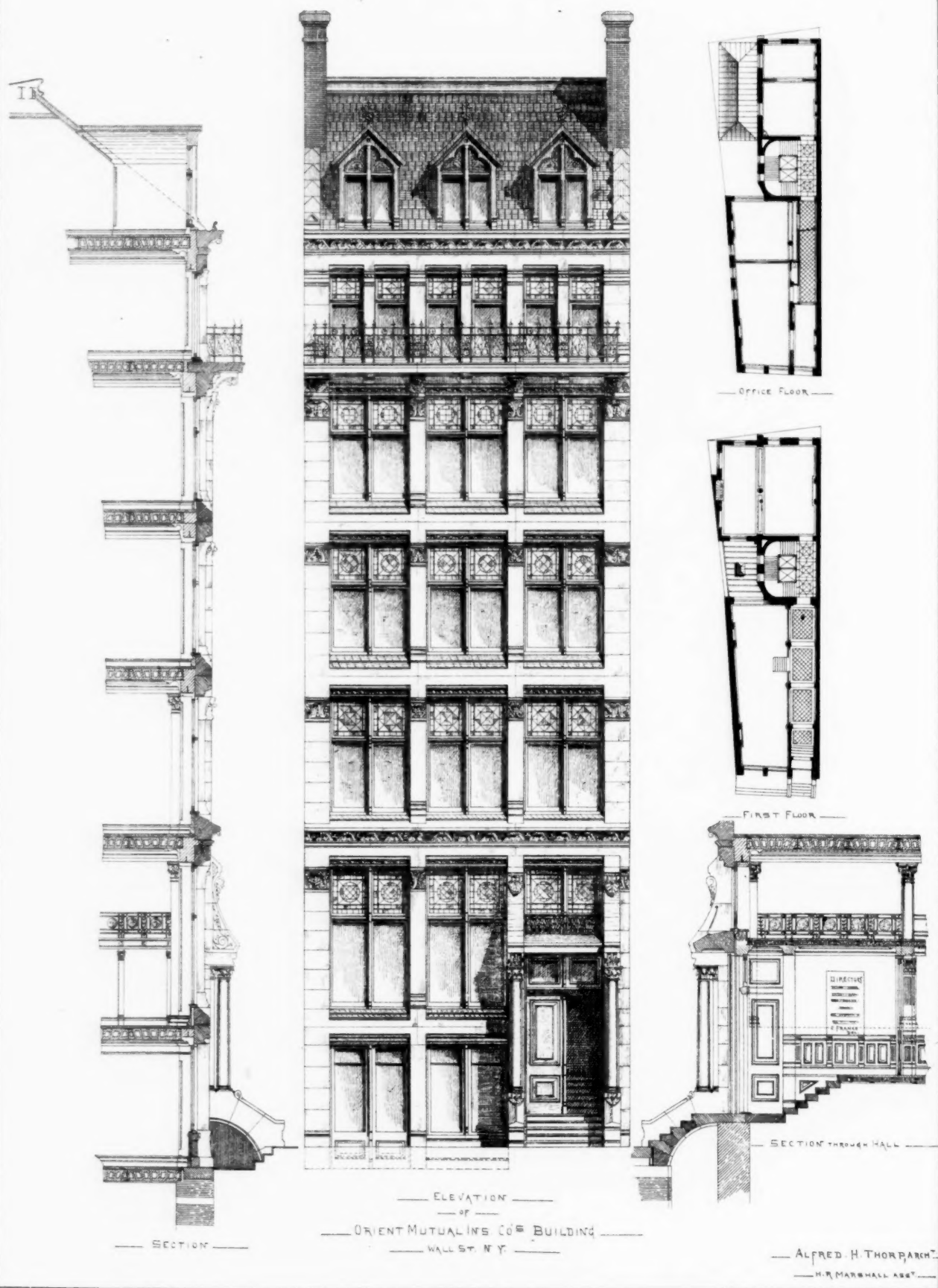
THE TAYLOR MAUSOLEUM. MESSRS. LAING AND FEHMER, ARCHITECTS.

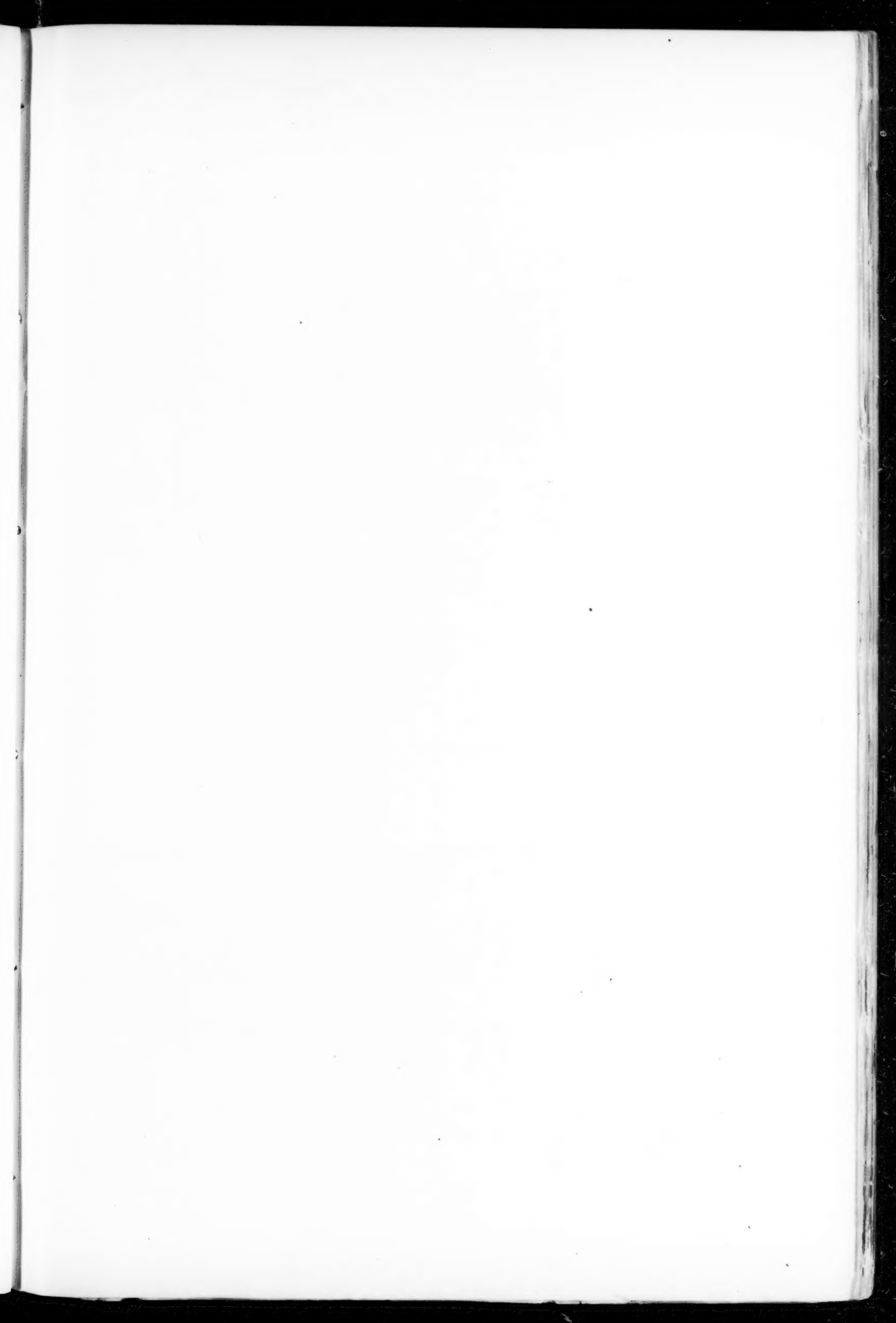
This mausoleum has recently been built at Graceland Cemetery near Chicago. The interior is large enough to contain ten coffins. The shelves are of blue marble, polished edge, with white Italian-marble tablets. The ceiling is groined, Philadelphia pressed brick being used for the vault, and blue dressed granite for the ribs, corbels, and centre boss. The interior walls are faced with polished marble of different colors. The floor is of English encaustic tile. The walls are built of brick, faced with Western granite, the main portion of the building being rock-faced, the plinth and quoins at the corners pointed with margin draft line around; the steps, window and door finish, cornice and roof, are patent hammer dressed. The shafts at the entrance are of red polished granite, the shafts in the louvre are of blue polished granite, the bases and capitals are of white Canaan marble. The doors and tracery of the tympanum are white Italian marble. The windows in the rear wall and tympanum are glazed with rich stained glass of appropriate design. The hardware is of solid bronze; but the gate is of wrought-iron. The entire cost of the mausoleum is \$10,000.

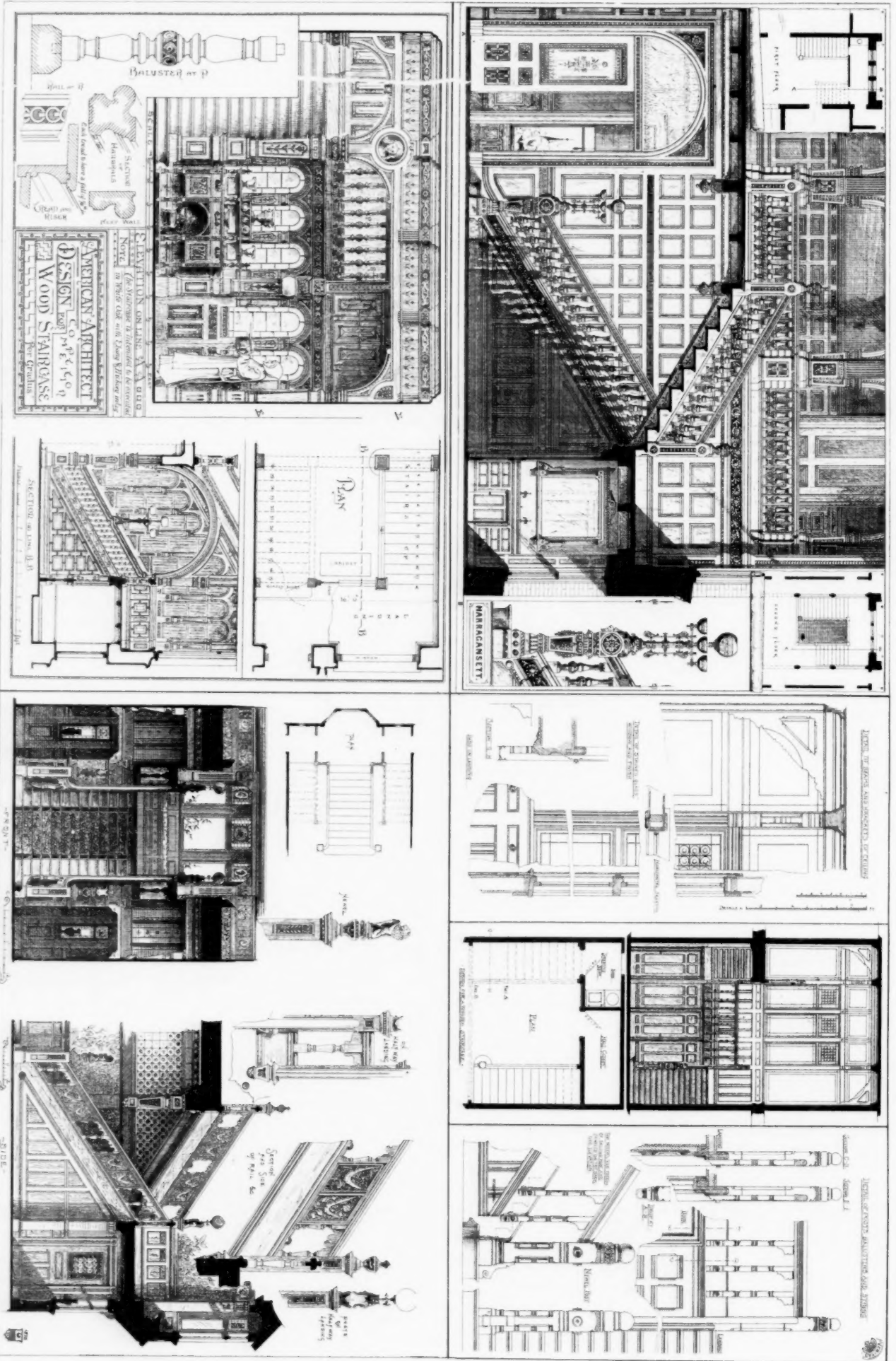
THE HIGHLAND HOUSE, CINCINNATI, O. MR. G. W. RAPP, ARCHITECT.

The Highland House, which was built in the summer of 1876, is at the head of the Mount Adams and Eden Park Inclined Railway, and is a species of *casino* which is used for a restaurant, and for balls, banquets, etc. In the basement are the kitchen, 18 x 30

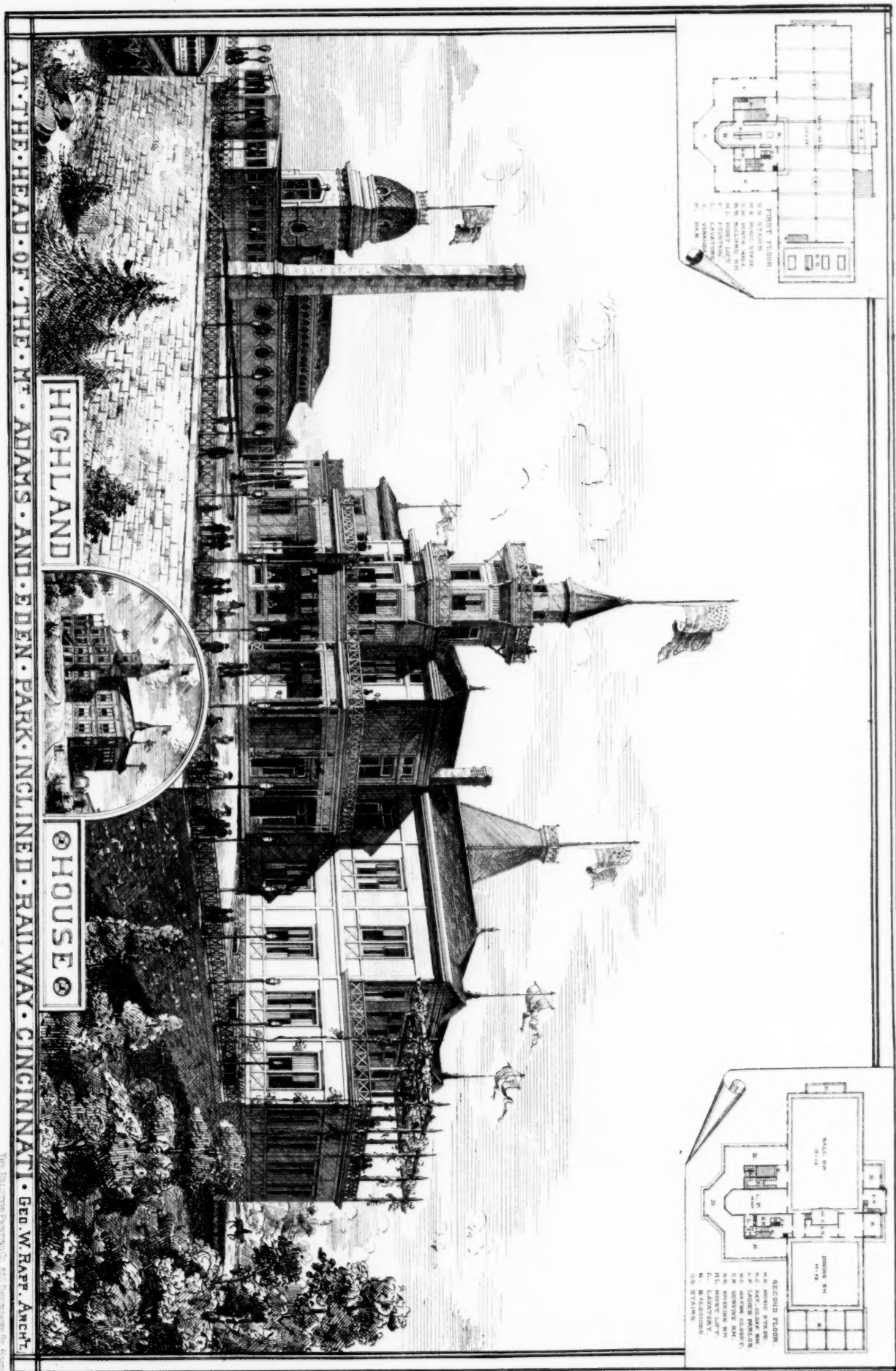


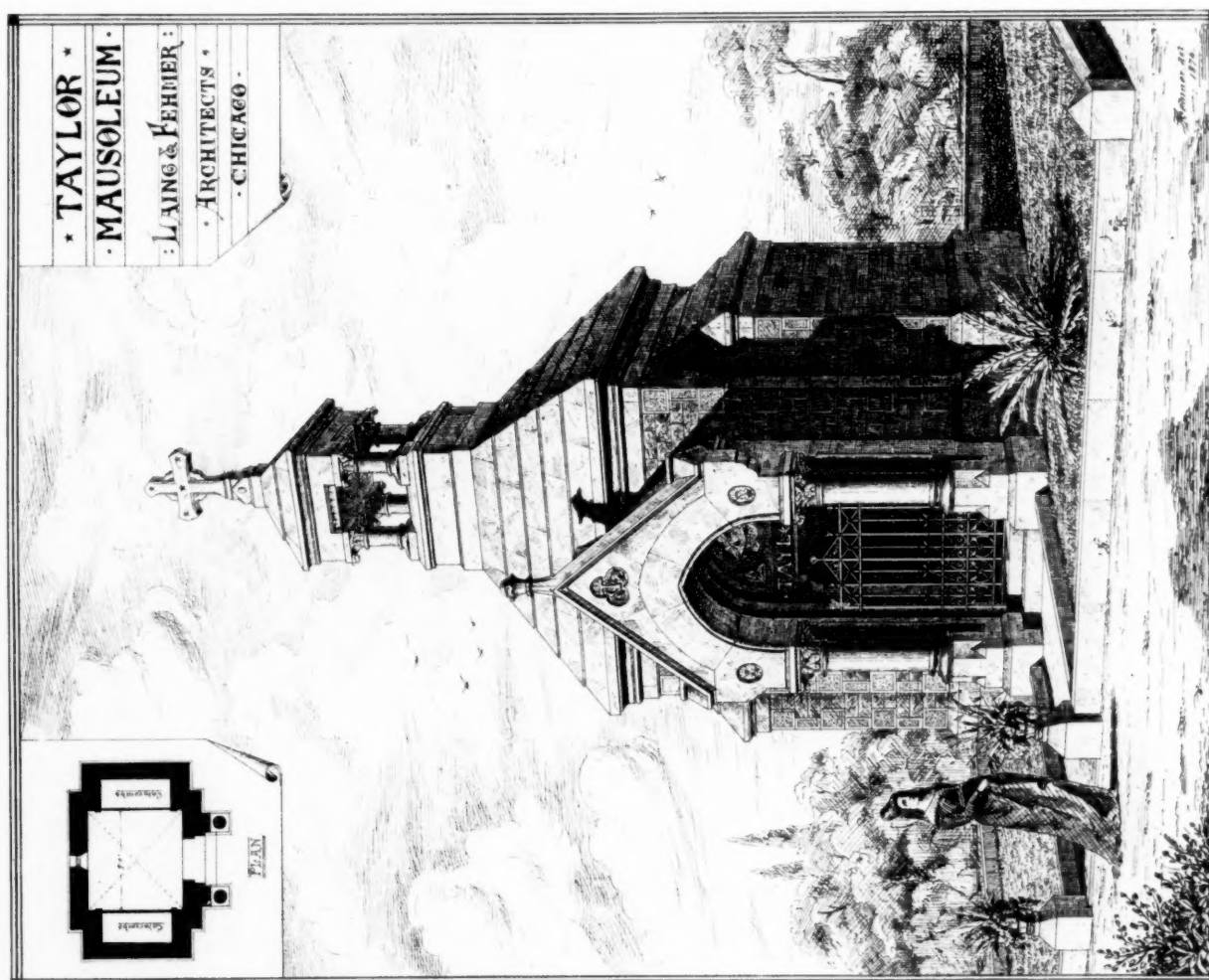
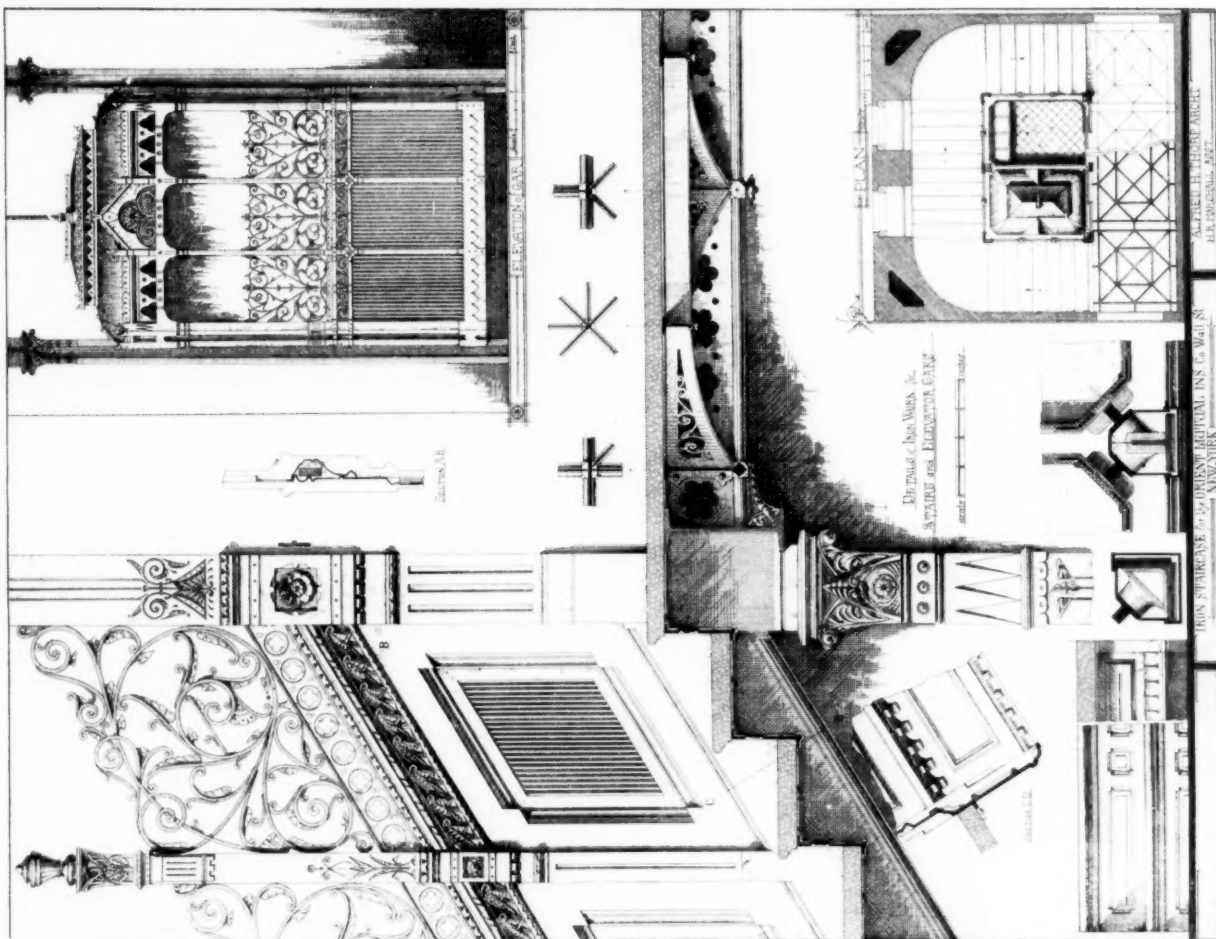






COMPLETIONS IN INTERIOR DECORATION.
No. 1 A WOODEN STAIRCASE.





feet, laundry, ice-cellars, bowling-alleys, etc. The plans show the arrangement of the other stories.

DESIGNS FOR A STAIRCASE.—COMPETITION NO. 1.

We have been much encouraged both at the number and quality of the designs which have been sent in for our first competition. We have received twenty-eight drawings, of which we propose to publish two pages of four each. In many cases the drawings are of so nearly equal merit that it is difficult to draw the line between them, and we cannot always be sure that those we select for publication are distinctly better than others which we omit for want of room. It may also happen in some cases, that designs which are excellent in idea, or even in performance, are unsuited for reproduction by reason of inexperience or other fault in drawing. Competitors can, by observing how their drawings appear when reproduced, draw their own conclusions as to what changes they should make in their style of drawing, in order to reach the most satisfactory results in our pages. We wish, however, to draw attention to defects that are common to almost all drawings that we receive,—crowding of lines and the want of perfect blackness in them. This blackness can always be best obtained by adding to the India-ink a little lamp-black or ivory-black.

We trust that those who have tried their hands at the first competition will continue as competitors in those which are to follow; for it should be borne in mind that the real good to the individual is not the winning of a prize nor the publication of his design, but rather the strengthening of his powers as a designer by the solution of a real problem, and the instruction he will receive in studying the solutions that others have reached in the same premises. We regret that several designs have been received too late to be admitted to the competition.

INTERIOR DECORATION.¹

This book is worthy of a name not vulgarized by the use of the word *art* as an adjective. We protest that it is much too good to be christened with such a commonplace abuse of good language. It is by no means a mere perfunctory piece of literary task-work. The hand to which the work was committed is too well-trained and too skilful, and the taste too just, to be content with any thing less than a thorough piece of work, within the essential limits of dilettanteism. These limits, however, are large enough to give space to an excellent and symmetrical historical compendium of the subject, not elsewhere to be found in such convenient shape, to a sufficiently correct statement of the question of materials and their applications to the uses of decoration, and to a modest and sensible sketch of the hall, the dining-room, the boudoir, the bedroom, the library, and drawing-room, as they should appear to meet the requirements of modern life, according to the views of a lady of good taste, breeding, and sound common sense. From the point of view of the artist, Mrs. Spofford's elegant chapters only touch the surface of things, and give him no new thought or inspiration. In other words, they do not pretend to be professional, and do not reveal any of the technical mysteries of the art of decoration. They will serve to make the art better known to the public, however, they will awaken a new and intelligent interest in the subject, they may purify and enlighten popular taste, and make the work of the artist better appreciated. Such books, therefore, have a *raison d'être* from every point of view, and the artist may welcome them not as rivals but as allies in the warfare of art against vulgarity. Among these books of amateurs we do not hesitate to pronounce that of Mrs. Spofford *facile princeps*. We further venture to say that even in the matter of practical suggestion it is quite as sound and much more copious than the well-known work on "House Decoration" by the Misses Garrett of London, who are recognized as professional decorators, and who, so far as we know, are her only competitors from her own sex.

The chapters entitled the Gothic Style, the Renaissance, the Elizabethan, the Jacobean, the Louis Quatorze, Quinze, and Seize, the Pompeian, the First Empire, the Moorish, the Eastlake, the Queen Anne, and the Oriental styles, which occupy about one-third of the whole book, are certainly excellent historical summaries, and as such we commend them heartily to the reader. They are temperate, just, and comprehensive. Mr. John Hungerford Pollen, in his *South Kensington Handbook on Furniture and Woodwork*, goes over nearly the same ground and in nearly the same space. He gives more names, dates, and facts, and is perhaps more satisfactory to the special student; but Mrs. Spofford excels not only in the literary presentation of the subject, but in the manner of describing the essential characteristics of the styles of which she treats, and their significance as illustrations of history. In this last respect especially, we know not where to find a better piece of work. Her general statement of the historical proposition in the opening of the chapter on the Renaissance is an admirable answer to those who say that questions of furniture are unworthy of study,—unworthy of the attention of intelligent minds. It is brief, and worth quoting:—

"That it has taken the historic movements of the world to produce the trivial things that constitute our household furniture,—allowing that our furniture is trivial, and not as vital and necessary as temples and towers themselves,—seems, at first sight, a monstrous declaration. But it is nevertheless true that the convulsions of empires and the epochs that have shaped the fate of races have also shaped the articles of our daily use; and the events that have brought about our styles of architecture have unfailingly reacted on our furniture, and produced new styles there too."

The distinctions which she draws between the styles of Louis Quatorze, Louis Quinze, and Louis Seize, and her definition of the peculiar significance of these styles as illustrations and expressions of their respective epochs, are conceived with great intelligence, and set forth with a precision and clearness which leave little to be desired. As she intimates, it is impossible to look at the furniture of these three reigns, and not observe how license in the first became profligacy in the second, and how these qualities were restrained into decency in the third. There could scarcely be a better epitome of styles than such a statement. The picture of the contrast between the furniture of the reign of Louis Seize and that of his predecessors is an excellent example of the curious relationship existing between history and the minor arts.

As for the "Eastlake style," she is more discriminating and just than we might reasonably expect an amateur in art to be. The half of the civilized world which speaks English is so beset with moral ideas in art,—the altar, the credence-table, the *reredos*, the *prie-dieu*, have been so secularized for use in modern drawing-rooms, and principles have asserted themselves with such uncompromising rigor, that a lay sister might devoutly embrace the straight-backed creed, and eschew all worldly curves and profane blandishments in chairs, tables, and sideboards, without exposing herself to the charge of bigotry. But she is enabled to give to this singular and notable incident in the history of art its due place without overshadowing all other historical developments. She admits the wholesome influence of the sound principles which underlie its manifestations; she gives due credit to the honesty and durability of these manifestations, and to the ingenuity with which high principles have often been made not inconsistent with forms of beauty; but she will not relegate to the dusty oblivion of the garret all the comfort and luxury that are implied in the type of the Louis Quatorze arm-chair.

"If the Eastlake, so called, is not all in itself that might be wished, if it is here and there a little inconsistent with itself, it yet represents a movement seldom if ever before effected by a single person; and it has succeeded in inaugurating a new *régime*, which bears the same relation to the loose and wanton Quatorze and Quinze *régime*, that virtue bears to vice."

In like manner the Queen Anne and Georgian revival is philosophically discussed, its historical relationships justly defined, and its details set forth with much of the feeling and sentiment, and with not a little of the knowledge and research, which are the essential requisites of the modern artist. Indeed, many designers, in reading what she has to say on this point, may add materially to their stock of information. She quotes from the discussions that arose in the Royal Institute of British Architects, and in the meetings of the Architectural Association, on this new revival, and takes issue with some criticisms of the *Builder*. She attributes to the style not only elegance and refinement, but dignity. "It makes none of the pretension of the Gothic, and has none of the wearisome iteration of the Classic. It seems," she says, "exactly the furniture to surround unostentatious people of gentle manners and culture."

It will be seen that, according to our views, this is on the whole no ordinary book. We took it up with a doubt and distrust begot of a title which, by mere association perhaps, savors of pretence and vulgarity, and of a prejudice that a *littérateur* could scarcely contribute any thing of real value to a subject requiring so much of knowledge, experience, and technical training, to understand it aright; and we have laid it down, feeling that in this book we have a possession which we hesitate whether to place on the shelf devoted to elegant *belles-lettres*, or on that where it would have the graver and rarer companionship of those who have written well upon matters of art and history.

It is to be regretted, that although we can scarcely find fault with the quantity and quality of the wood-cuts, they serve simply to decorate the page, and have but little if any connection with the text. Indeed, the text does not allude to the prints more than two or three times; and the eye which seeks among them for an explanation, a confirmation, or illustration of a passage especially requiring such aid, is doomed either to disappointment or perplexity. These wood-cuts are selected from Viollet-le-Duc, Pullan, Talbert, Shaw, and other authorities, without further acknowledgment than a brief and inconspicuous general notice in the preface. Talbert's name, by the by, we do not see noticed at all. It would seem that at least the recognition of a foot-note had been earned by those whose works have been borrowed to decorate these pages. Let us hope that in the next edition, which we trust will soon be reached, this oversight will be remedied; and, better still, that enough especial illustrations may be introduced to enable the unprofessional reader to have something more trustworthy than his own imagination to depend upon, especially in matters requiring such delicate discrimination as the distinctions between the styles of adjacent reigns.

¹ Art Decoration applied to Furniture. By Harriet Prescott Spofford. With Illustrations. New York: Harper & Brothers, Publishers, Franklin Square. 1878.

BOOK NOTICES.

HOUSE-PAINTER'S HAND-BOOK.¹

If other writers of hand-books would give as clear and concise information upon the subjects they treat of, as Mr. Stevens has given in the little treatise before us, the task of the student and practitioner would be materially lightened. Apprentices, painters, and architectural students should read it with attention; and even older architects can learn much from its pages, and will for the first time, perhaps, appreciate the true meaning of certain stipulations and directions that they are in the habit of mechanically incorporating in their painter's specifications. The book treats of materials, mixing, qualities and properties of paints and oils, dry wood, wet wood, rain and dew, repainting, roofs, old paint, etc. The author has his peculiarities of style and opinion, but as a rule sticks to the practical treatment of his materials; and although he does say, "Blinds should vary in color according to the style of architecture; for a Gothic house, they ought to be of a shade between the trimming and the body, and may be improved by having the panels light and stiles dark," he usually leaves aside the æsthetic consideration of his handicraft.

ORNAMENTAL ALPHABETS.²

The first impression that one gets on looking through this quarto volume of eighty lithographic plates, printed on heavy cream-laid paper, is that the draughtsman who shall seek aid from its pages will inevitably add to the exasperation that almost always arises in the lay mind when compelled to decipher the title of an architectural drawing. There are, however, some few alphabets or portions of alphabets that may, with proper caution, be used by the draughtsman in every-day work. Church Text, Old English, and German Text are all the regularly acknowledged alphabets that are given. Besides these there are two or three alphabets from old manuscripts, which give the book a certain antiquarian flavor, slight though it be.

DER ROHRLEGER.

A new periodical appears in Berlin, bearing the title *Der Rohrleger*, that is to say, The Pipe-layer; it has for a specialty the interests of those who supply buildings with light and warmth, water and air. This branch of architectural engineering, which has made so rapid an advance in the last two decades, is of universal bearing, and of particular importance to public hygiene. It is true, almost all technical papers give more or less attention to the theme; but having wider or different purposes in view, none of them have treated of the subject otherwise than as wholly subsidiary to these, until the new *Plumber and Sanitary Engineer* came to occupy the ground among us. The appearance of the *Rohrleger*, as a specialist, is a welcome accession to professional literature, and promises a record of every improvement in the methods of warming and ventilating our structures and of providing them with water and gas.

THE ART WORKER.

We have to record the appearance of a new fellow journal, the *Art Worker*,³ a monthly magazine of designs for decoration. Its purpose is sufficiently shown in the following extract from its prospectus:—

"The scope and purposes of the *Art Worker* are fairly indicated by its title; viz., to supply good design of the later styles, in response to the growing demand created by the increasing public interest in all branches of art-industry. Illustrations of examples of decoration, ornament, and furniture will constitute its principal feature; though, owing to the wide field to be covered, many other subjects will necessarily receive treatment in its pages. The selections will be made with a constant view to technical and practical utility, and no effort will be spared to secure and maintain a uniform standard of excellence in the material."

It is to be published in monthly numbers, of which two have been sent to us, containing six and eight quarto plates on tinted paper, lithographed from pen-drawings and very fairly executed. They include a number of spirited designs for furniture, glass, and painted decoration, — most of them well drawn, some not so good, — of a kind likely to be useful to people who are looking for suggestions, and representing very well the principal styles of work in vogue among us. Three clever figure designs from Mr. Charles Booth, glass-stainer, lead off the first number, and prints selected from the designs of Mr. E. W. Godwin and Mr. Hulme furnish no larger amount of foreign matter than may naturally be looked for in a new serial. It is a magazine of plates only, containing no letterpress.

DURABLE PAINT FOR OUT-DOOR WORK. — Grind powdered charcoal in linseed oil, with sufficient litharge as a dryer. Thin for use with boiled linseed oil.

¹ The Art of House-Painting; being a Clear and Comprehensive Record of the Observations and Experiences, during many years, of a practical worker in the art, and designed to instruct and assist in the every-day work of painters and others. By John Stevens. Published by John Wiley & Sons, New York, 1877. Price \$1.75.

² Woodward's Ornamental and Fancy Alphabets, Monograms, and Titles. Geo. E. Woodward, New York, 1877.

³ The Art Worker, a Journal of Design. Published monthly by J. O'Kane, 31 Park Row, New York. Nos. 1 and 2. Price one dollar each.

THE AMERICAN INSTITUTE OF ARCHITECTS.

CINCINNATI CHAPTER.

THE Cincinnati Chapter, which has been dormant for some months past, has at last roused itself to the realizing sense that it may still be of some use in the community; at least, it seems as though a decided effort was to be made to keep it in existence; and to this end an election of officers was held on the 19th ult., to serve during the ensuing year, with the following result:—

President, James W. McLaughlin; Vice-President, Edwin Anderson; Treasurer, George W. Rapp; Secretary, Charles Crapsey. After this business was accomplished, a discussion was had as to the letting of contracts separately for the erection of buildings. Mr. Nash said that he had always advocated this mode of contracting, and had carried it into execution whenever possible. It worked better results to the owner; it was better for the principal contractor, so called; it was better for the sub-contractor; it was better for the architect. It compelled the architect to be very careful in the preparation of his specifications, in order to avoid any conflict of interests among the several contractors; to define clearly and without question what each must do, and how he must do it. After the contracts were let, however, the architect had an easier task in dealing directly with the head of each department, rather than at second-handed, or through the principal. Mr. Nash gave several personal experiences to support the ground he held. He would urge the matter upon the attention of his fellow architects, and hoped they would whenever occasion offered carry this practice into execution. Other members took similar grounds with Mr. Nash, the matter being thoroughly canvassed in the discussion which ensued.

PAINTING AND SCULPTURE AT THE CENTENNIAL EXHIBITION.—IV.

[The report of Mr. John F. Weir in behalf of the judges of Group XXVII., embracing Plastic and Graphic Art.]

SPAIN.

A MARKED feature of the exhibit of Spain was the prominence accorded historical subjects. The Spanish school of to-day is not surpassed in technical excellence nor in the profounder aims of art; but as many of their strongest painters have pursued their studies in Paris, where their works are to be seen rather than in their own country, these have been more popularly classed with the French school. Zamacois, Fortuny, Madrazo, Agravat, Ruyter, Vallés, Gisbert, Vera, Escosura, and others, have made Spanish art favorably and widely known. The first united with extraordinary technical skill a profound and subtle meaning in his art. He was perhaps the most accomplished and piercing satirist of the time.

The Spanish collection at Philadelphia contained several representative works of great interest. A very large picture of "The Translation of St. Francis of Assisi," by B. Mercadé, was well worthy of study. The subject is treated with great purity of feeling, and indeed solemnity. The expression of the heads is very fine, and the composition simple and impressive. The picture is cold and monotonous in color, but in the sincerity of its aim it is admirable. "The Insanity of Donna Juana de Castilla," by L. Vallés, is also a work of great power; and "The Landing of the Puritans in America," by A. Gisbert, is serious and thoughtful; the figures have great dignity and simplicity of character. These pictures were loaned by the Museum of Fine Arts at Madrid.

"The Two Friends," by J. Agravat; "The Burial of San Lorenzo, at Rome," by A. Vera; and "Sacristy in the Cathedral of Avila," by P. P. Gonzalvo, are also conspicuously worthy of commendation.

In landscape the Spanish exhibit contained little that evinced marked sympathy with this branch of art; and in sculpture the only examples worthy of mention were "The Wounded Bull-Fighter," by R. Nobas, and "Dante" (in bronze), by G. Suñol.

The impression gathered from the large historical works mentioned above was a very favorable one, and in this style of art the Spanish exhibit was especially admirable.

ITALY.

The Italian exhibit in painting did not do justice to the reputation which this school now enjoys through the widely-known merits of certain Roman artists, whose works we here looked for in vain.

Italian painting has recently acquired new life and vigor, partly through the influence of the French school, but mainly by a very praiseworthy return to the serious study of nature, in lieu of the conventional adherence to formal traditions that had long been unfavorable to its progress. Within the past few years it has made an extraordinary advance, and acquired thorough technical methods peculiar to itself, as well as great brilliancy of coloring. But the true excellence of this school was not represented at Philadelphia. The most noteworthy pictures in the collection were the "Evocation of Souls, from 'Robert le Diable,'" by R. Fontana; "The Interior of St. Mark's," by Luigi Bisi; "Interior of the Choir of the Cathedral of Parma," by S. Marchesi; "The

Escort," by G. Fattori; "Preparation for a Feast at Pompeii," by A. Scifoni; "A Grandmother's Admonition," by M. Cammarano; and two portraits by C. Maccari. — the latter being specially commendable. It is to be regretted that a more adequate representation of the merits of this school was not given.

In sculpture the Italian exhibit was very large, abounding in what may be termed *genre* sculpture, — in subjects of a domestic and familiar character that are better suited for pictorial representation than for plastic art. The impression made by these works was not a favorable one. The display of remarkable subtlety in the manipulation of material, in the dexterous undercutting and intricate chiselling, which rendered many of the sculptures curiosities rather than works of art, gave evidence of great skill in workmanship; but there was little that was essentially and vitally sculptural, and the collection, on the whole, was frivolous and unimpressive. There were, however, some works that bore evidence of a more genuine artistic aim, and among these may be mentioned "Modesty" and "Hope," by A. Botinelli; "Love is Blind," by Donato Bareaglia; "Timidity," by L. Torelli; "Youth of Michael Angelo," by E. Zocchi; "The Flower," by C. Pietro; "The White Rose," and "The Orphan," by P. Guarnerio; "Dreams of Youth," by G. Argenti; "Boy and Swan," by R. Perduzzi; and "Love's Nest," by R. Perida.

The wood-carvings of Luigi Frullini were worthy of admiration, exhibiting great beauty of design and very subtle skill in execution.

SWEDEN.

The exhibit of Sweden in painting bore evidence of very decided merit. French and North German influences are plainly recognizable, and it is difficult to trace a distinctive national character in their art; but, on the whole, there is proof of sound discipline and true artistic aims. A most admirable portrait by Count von Rosen was not surpassed by any thing of the kind in the Exhibition. It is painted with rare skill and feeling, fine in color, and well drawn. An "Odalisque," by Hugo Salmson; "Maid with an Open Letter," by G. Saloman; and "Market Day in Düsseldorf," by A. Jörnberg, were the most noteworthy *genre* pictures of the collection; and in landscape, "Birch Forest," by E. Bergh; "Fishing Harbor," by Baron Hermelin; "Beech Forest," by A. Kallenberg; "Coast Scenery," by A. Nordgren; "Moonlight Landscape," by H. A. Wahlberg; and "Summer Evening," by P. Ekstrom, are worthy of special mention.

In water-color painting the most favorable examples were by Miss Anna Gardell.

NORWAY.

The Norwegian exhibit in painting resembled that of Sweden in character. The best examples of the figure bore evidence of foreign training and influence, and, while they exhibited decided merit, there was little that was distinctively national. In landscape, however, this is less marked.

The most important picture of the collection was "Ruth and Boaz," by Otto Sinding. This picture is a production of mature art, admirable in sentiment, in breadth and freedom of execution, and fine in color. The figures are thoroughly well drawn, and the landscape skilfully rendered. "A Fresh Breeze," by H. Gude; "Birch Forest," by S. Jacobson; and "A Summer Morning in the Birch Forest," by J. M. Grimelund, are also commendable.

RUSSIA.

There was very little in the Russian exhibit in painting of a character to warrant favorable criticism. The pictures displayed but little technical skill, and were generally dry and mannered. The most pleasing examples were "The Sunday Tea-party," by Alexis Koorzochin; "Ice-drift on the Neva," by A. Bogolioboff; and the landscapes of J. T. Aivazowsky.

SOME OF THE ADVANTAGES OF THE METRIC SYSTEM TO ARCHITECTS AND BUILDERS.

TO THE EDITOR OF THE AMERICAN ARCHITECT AND BUILDING NEWS.

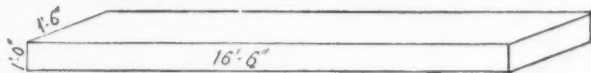
Sir, — A client one day wrote upon my blackboard these figures: "24 cu. ft. 1296 cu. in.," asking what well-known measure they signified, and if they were the correct expression of the measure they pretended to designate.

If I found myself vanquished, Mr. Editor, after wrestling for a time with this conundrum, ought I necessarily to feel mortified thereat, and could my client justly have argued that such ignorance of ordinary weights and measures unfitted me for the practice of my profession? If, after that, my client put his question in another form by substituting for his figures the following diagram, ought I to have felt mortified when, though recognizing the measure and knowing its value in cubic feet, I could not certify to the correctness of its proportions?

For my own satisfaction I questioned a number of architects and builders, with the following result: —

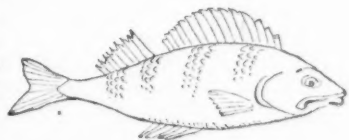
The first builder was a Philadelphian. He gave the value of

the perch as 22 cubic feet.¹ The next was from Providence. Though accustomed to reckon his stone-work in cords and cord feet, he sometimes came across the perch, and therefore knew its value to be 24 cubic feet. Some masons he said, however, used the cubic yard. Another, from Boston, put it at 24½ cubic feet,



which is generally accepted as correct. Still another, who had done work in various States, made it a round 25 cubic feet for convenience, he said, of calculation; but in cases where it was considered important that the value of the perch should be understood by both parties to the contract, he generally specified at the outset the number of feet it was to contain.

As for the figures "24 cu. ft. 1296 cu. in.," none of the builders recognized them. I was therefore satisfied that they had it in their power to give the perch almost any value best calculated to suit their convenience without liability to conviction for fraud. All these builders, by the way, objected to the metric system on the ground that it would necessitate their learning their tables all over again. As for the architects, I found that to convey the idea of exact magnitude, the expression, "as big as a piece of chalk," or "as a good-sized fish," would be more useful; and if my client had drawn the diagram of his perch as shown, I believe he would have hit upon a more unvarying standard of weight and measure than he found in our unfortunate *land* perch.



Such, then, being the condition of things with regard to the perch, I resolved to make a test with some of the weights and measures in our tables still more familiar and more generally used, lest any one should object that I had taken the hardest I could find. I took the acre, the ounce, and the quart, and asked about them these very natural and practical questions: —

What is the length of one side of a square acre?

How do the ounce and pound Troy compare in value with the ounce and pound avoirdupois?

How do the milk, beer, and wine quarts compare with each other in value?

I also asked what the following measures were, and what relation they bore to each other: tierce, kilderkin, quarter, quartern, ton, and tun.

Up to this day I have been unable to find a single individual who could answer correctly any one of the above questions; and I ask you, Mr. Editor, if I am not safe in saying that there is not a man living in the United States who could give an exact answer to all four questions, simple as they appear, without referring to books? It is enough to learn that the ounce Troy is greater than the ounce avoirdupois by $\frac{1}{16}$, while the pound Troy is less than the pound avoirdupois by $\frac{3}{16}$, and that the relation between the wine tun and the ton avoirdupois is expressed by the convenient fraction $\frac{22 \frac{1}{2} \times 5 \frac{1}{2} \times 7 \frac{1}{2}}{20 \times 10 \times 10}$ (about), to see that I am altogether likely to be safe in my assertion.

In the earliest stages of civilization and among savages, commerce is generally conducted in the form of barter; or, if some conventional standard of weight and measure is used, it has at least, in general, the advantage of simplicity, and a name indicative of its approximate value. With our worse than barbarous conglomeration of standards, where the name has been twisted and misapplied until it no longer has any relation to the substance, — a hundred signifying a hundred and twelve; twenty-eight, twenty-five; and a dozen, sixteen, — or where the same name refers to different things, and where the whole is no longer equal to the sum of its parts, the opportunities for fraud and embarrassment in all business transactions, and the waste of time and money in all the various works of life, become so serious as to rank among the most formidable obstacles to the advance of our civilization.

The only remedy I see for this evil is the universal adoption of the metric system; a system according to which the weight and dimensions of every material thing, whether solid, liquid, or gaseous, whether on land or on water, whether in the earth or in the heavens, and whether determined by the scale, plummet, balance, barometer, or thermometer, are ascertained by a method absolutely uniform, entirely simple, and equally suitable to the use of all mankind, resting upon a single invariable standard of linear measure, with multiples and submultiples, like those of our monetary system, exclusively decimal, with appropriate names, similar in all languages; and itself secure against the possibility of change or loss through carelessness or accident or design, by being constructed on scientific principles, and copied for distribution among the different nations of the world.

The following problem, solved first by the English and then by

¹ Solid contents of a wall sixteen inches thick (taking of the wall a piece which is a rod, pole, or perch in length, and one foot high).

the metric system, shows how much may be saved by the latter in our calculations.

PROBLEM.

What is the solid contents, in cubic yards, feet, and inches, or metres and centimetres, of the brickwork in the walls of a reservoir 19' 8" (6 m.) square, 22' 0" (6.7 m.) high (inside measure), and averaging 4' 8" (about 1.4 m.) thick; and what is the exact weight of these walls on the foundations?

Also, what is the amount and weight of the water which the reservoir would contain?

Given weight of 1 cubic inch of water = 252.7153 grains.

" specific gravity of brickwork = 1.6

And it being known that 1 cubic centimetre of water weighs 1 gram, or that 1 cubic metre of water weighs 1 metric ton, or 1000 kilograms.

In the first solution 876 figures are used, and only an approximately accurate result is possible.

In the second solution only 74 figures are used to obtain an absolutely accurate result.

In the second the answers may be read differently: thus, answer 1 may be read, 277 cu. m. 618 cu. decimetres; answer 2 may be read, 444 tons 236 kilograms 800 grams, without changing the figures, but merely removing the decimal points.

In the first solution there are *twenty-five* distinct mathematical operations requiring the use of the pencil, or which cannot easily be performed in the head alone.

In the second only *two*.

J. P. PUTNAM.

[The example prepared by our contributor proved only too convincing, inasmuch as to print his computation would have involved the sacrifice of several other communications. We therefore beg our readers to accept the editors' assurance, or else to prove by direct experiment, that the difference in figuring by the two systems is enormous.—EDITORS AMERICAN ARCHITECT.]

COMPETITIONS IN INTERIOR DECORATION.

COMPETITION NO. II.—INTERIOR OF A BAY-WINDOW.

THE subject of the second competition is a bay-window, as seen from the drawing-room in the second story of a city house. This drawing-room is fourteen feet high in the clear. The width of the room is twenty feet, and the opening of the bay is not to exceed ten feet. The plan of the bay, the scale of the drawings,—provided they are included on one sheet of the prescribed size,—and the materials used in construction, are optional with the competitor. The drawings required are a plan, an elevation as seen from within, showing how the opening is made to harmonize with the treatment of the drawing-room, a section showing the nature of the external treatment, and details to a larger scale than the principal drawings. The manner of supporting the wall over the opening of the bay should be indicated. The drawings must be received at the office of the *American Architect and Building News* on or before March 30. The conditions of this and of subsequent competitions will be the same as those which governed the first (see *American Architect and Building News* for Jan. 26). The scale of the various drawings should be represented graphically on each drawing.

NOTES AND CLIPINGS.

TOWN-HEATING BY STEAM.—The experiment of heating the city of Lockport, N.Y., by steam under the Holly system, has, it is said, proved highly successful. The following results are reported: Three miles of pipe, covered with non-conducting material, laid underground, radiate from a central boiler-house; and fifty different dwellings and other edifices, including one large public-school building, have been thoroughly warmed all winter by steam thus distributed and turned on or off as required by the tenant. Dwellings more than a mile distant from the steam-generator are heated as readily as those next door. Steam-meters are provided, so that each consumer need pay only for what he uses. It is stated that the system can be so developed as to furnish steam at fifty pounds pressure, transmitted through twenty miles of pipe, which could, therefore, supply power for engines and manufactures, and steam for baking and laundry purposes, for extinguishing fires, for cleaning streets of ice or snow, or protecting hydrants from frost. The rates actually charged to the consumer do not exceed what his coal and wood cost him to produce the same result.

THE WEST POINT HOSPITAL.—After the United States Government had begun to build a hospital for the Military Academy at West Point, it was discovered that the records proved that not more than seven cadets had ever been sick at one time, whereas the new hospital would accommodate about three hundred patients.

A RELIC OF THE EXHIBITION.—Signor Guarnerio's immense bust of Gen. Washington, with which a little eagle was vainly trying to fly off, which afforded so much amusement to the visitors at Memorial Hall during the Centennial Exhibition, was lately sold at Philadelphia for non-payment of customs dues. One dollar was the highest bid that was made for it.

BURNING WELLS.—Near Green Sulphur, Ky., is a well which was bored by an old farmer some forty years ago, who expected to get salt water from which salt could be manufactured. The water was obtained, but so impure was it that the scheme was abandoned, and the unpleasant liquid poured itself into the Dix River. Some time afterwards one of a party of men while gigging fish by torchlight accidentally set fire to the surface of the river by dropping his torch. The flames spread rapidly in all directions, and the frightened inhabitants thought that the Day of Judgment was upon them. What flowed from the well, and was the cause of this conflagration, was of course petroleum. This has long since ceased to flow, and in its stead the shaft is filled nearly to the brim with a clear odorless brine which has this striking peculiarity, that, let a few buckets of water be drawn from the well, and the water will begin to boil and bubble furiously; then if a lighted match is dropped into the water, a column of fire will shoot into the air for several feet, burn for half an hour or so, and die down, only to shoot up again if more water is drawn from the well. Another and more remarkable burning well is near McConnellsville, O., where Mr. T. W. Williamson when boring for oil struck a vein of gas, apparently inexhaustible. Into the top of the boring three pipes have been fitted, through the largest of which about four-fifths of the gas escapes vertically. This has been lighted, and has for months burned steadily with a flame some twenty feet or more in height. By one of the smaller pipes gas is conveyed to a stationary engine which pumps oil from two neighboring wells, by the other, a three-quarter-inch pipe, gas is conveyed to the house where it is used for cooking, warming, and lighting, to the exclusion of all other fuels. As the gas is remarkably pure, and burns with clear white light, no odor is perceptible about the house.

CREMATION.—Every now and then the advocates of incineration as a mode of disposing of the dead receive new recruits in this country and abroad, in persons who desire that their own bodies or the remains of their relatives shall be reduced to ashes; but it is easy to see that the commercial instinct has quite as much influence in the matter as the wishes of the deceased, or the belief of the survivors in the sanitary efficacy of cremation. That those who have built re-torts and furnaces should demand a fee for their services, is only just; but that a husband should give a public lecture on the process and results of cremating the body of his wife, is only more abhorrent than the action of the man who uses the ashes of his eight-day-old child as samples when negotiating with possible clients.

ICE MACHINE.—There has lately been shipped to New Orleans a huge ice-machine, whose capacity is fifty tons daily. The gas-compressing pump and frame is 13 feet 6 inches high, and 6 feet 6 inches wide at the base; the cylinders have 24 inches bore by 36 inches stroke, and weigh 48,805 pounds. The refrigerant is liquefied ammonia gas vaporized and again liquefied by mechanical compression. The cold produced by the vaporization is 45 degrees below zero, Fahrenheit. The cost of manufacturing the ice in New Orleans will not much exceed one dollar per ton.

A MOUND-BUILDERS' IDOL.—The workmen employed on the site of the new penitentiary at Chester, Ill., dug up, the other day, a figure which is supposed to be a relic of the mound-builders. It is an image, supposed to be an idol, sixteen inches high, made of slate or soapstone, and in a sitting posture. On its breast and abdomen are numerous figures and characters, including the picture of a man in a sitting posture, an elephant, and a human foot, and on the back is a horse's head, a frog, a fish, a turtle, etc. On the head is a band inscribed with some characters which may be hieroglyphics.

CASTS OF THE SCULPTURES AT OLYMPIA.—Letters from Athens state that the moulder authorized by Government has started for Olympia, to take casts of the most recently discovered sculptures, viz., of the Apollo belonging to the west front of the temple, and of the Hermes of Praxiteles. When these reach Germany all the Olympian casts, collected now in the Campo Santo near the Cathedral in Berlin, will be publicly exhibited. The sculptures of the east gable are complete in all important parts. The above-mentioned Apollo—the central figure—is alone wanting to perfect the western pediment, a composition far more remarkable for life and action than is that facing the east.

TIN IN OLD RIVER-BEDS.—Running water leaves on the earth's crust marks as permanent as any of the violent convulsions of nature. The discovery has lately been made in Australia, that the streams of the tertiary period, streams many millions of years ago, but now dried up, are vast storehouses of wealth. They are carefully searched out and worked for tin. They acted in precisely the same way as the rivers of our own day, washing away the lighter rock, and leaving a concentration of the heavy ore in their channels. They vary considerably in depth, according to the remoteness of their origin. In one of them a shaft has been sunk to 60 feet, and at that depth the ground is a regular river-bed, with, in some places, a collection of loose drift sand, heavily intermixed with tin-ore. It has been opened at that depth, to the distance, horizontally, of 2,000 feet, and explored by boring from the surface for 600 feet more. The width of the seam has increased from 18 to 400 feet, and it contains an average of three feet of what the miners call "pay dirt," that is to say, soil worth working, for it yields about 1½ per cent of metal, an excellent produce for tin-ore. Some of these deposits are discovered at only a few feet from the surface, a fact which shows that they are of much later date than the one referred to above, but still of immeasurable antiquity. The state of the earth also shows that these later rivers were not in action for very long periods, as the ore has been far less washed. Twenty-five of these tin-mines have already been found; and although the difficulty attending all new enterprises has retarded their development, yet within two years they have produced 2,059 tons of ore, worth about \$1,000,000.