THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. X. Copyright, 1881, JAMES R. OSGOOD & Co. No. 299.

SEPTEMBER 17, 1881.

Entered at the Post Office at Boston as second-class matter.

CONTENTS.

THE Architectural Department of the Massachusetts Institute of Technology will open its next academic year under a new organization, which, while retaining the main features of its former curriculum unchanged, is intended to enlarge its scope materially, and provides some important additional facilities for instruction. The work which until now has devolved on one professor will hereafter be divided, Mr. T. M. Clark representing the general interests of the school as Professor in Charge, while Mr. W. P. P. Longfellow will act as Adjunct Professor of Architectural Design, aided in his department by Assistant Professor Létang. Mr. F. E. Kidder, S. B., will give instruction in a new department, to be known as the Architectural Laboratory, where the properties of materials will be studied by means of actual tests, and the theory of construction illustrated by practical exercises and experiments. The habit of free-hand sketching, which has always received much attention at the Institute, is to be still further encouraged, and provision has been made for special instruction by some of the best architectural draughtsmen in Boston, in pencil sketching, pen-and-ink rendering, and perhaps in water-color drawing of an advanced character. Through the good offices of the Boston Society of Architects, whose friendly interest has always been of much service to the School, the regular course of study in ornament and the arts allied to architecture will take the form of familiar lectures, delivered before the students by members of the Society and others. In this course for the ensuing year Mr. Henry Van Brunt has consented to treat of the Theory of Ornament; Mr. Charles A. Cummings will give a series of lectures upon Interior Design; Mr. Arthur Rotch upon Decorative Painting; Mr. Longfellow on Stained Glass and Mosaic; and other gentlemen will consider certain related topics. In addition to the regular branches pursued at the school, the students will continue to enjoy the advantages which a close and friendly relation between the authorities of the Institute and those of the Museum of Fine Arts has hitherto afforded them, and which increases from year to year.

THE courses pursued in the Architectural Laboratory of the Institute will form a somewhat novel feature of technical instruction, but will, it is hoped, prove useful in many ways. The principle now universally accepted in teaching natural history, that the laws of structure and form can be properly comprehended only by studying them as exemplified in actual specimens, has begun to find application in other branches of scientific education, but its peculiar value in architectural study, although understood by those who have devoted attention to the subject, has not received the public recognition that it deserves. It is difficult for any one but an expert to understand how much our architecture suffers, not from want of science on the part of constructors, but from the lack of ready application at all times of the science which they possess. The principles of statics and those of architectural form are almost completely dissociated in our minds, so that, for instance, a square-headed opening, or a pointed arch, unless of extraordinary dimensions, will suggest thoughts of proportion, aspiration, sentiment, or anything else but transverse strain and horizontal thrust. This is well enough in its way, but it is by no means incompatible with an ever-present sense of constructive relation: on the contrary, the skilful handling of material lends to an architect's work its crowning charm, and although a building may be beautiful that derives from concealed ties and beams the support which the apparent construction is incapable of affording, it will never be called masterly, nor compete in interest with those designs which show, in addition to grace and feeling, the simple, truthful, and successful solution of a given problem in construction. The best way to acquire the instinctive sense of constructive propriety is to make actual observations of the effects of strains in as many cases as possible. One who has seen a stone lintel yield under a weight which he has himself placed upon it will have the relation between its thickness and resistance indelibly impressed upon his mind, and although he will still need the help of formulas and empirical constants to determine the exact resistance in any given example, he will never make the mistake of forgetting altogether or disregarding the fact that there is a limit to the strength of stone. With arches, trusses, piers, and ties also, one who has himself placed voussoirs in position, and after removing the centre has seen the abutments spread and the crown fall, will thenceforth think of arches, not as mere curves, but with an inseparable relation to their abutments; and so in the other cases. The pursuit of this study, and the cultivation of the constructive instinct which it is intended to develop, may be carried very far, and as by means not very dissimilar the great system of mediæval architecture was evolved from the analysis of certain constructive needs, so it is not unreasonable to suppose that the study by vivisection, so to speak, of modern materials and methods may ultimately prove a powerful means of influencing the future of the art.

THE long discussion about the Buffalo Soldiers' Monument has come to an end, by the adoption of Mr. Keller's design, under the motto "Postage-Stamp." As our readers will remember, this, together with all the other designs submitted in the second competition, was rejected, and a committee was appointed to go to New York and solicit designs from eminent sculptors there. In carrying out this plan, the committee called upon Mr. St. Gaudens and Mr. White, the sculptor and architect of the Farragut monument, and upon Mr. Le Brun, a well-known architect of New York. These gentlemen declined to enter into any competition, but were willing to accept the commission if it should be entrusted to them. One of the special committee, who appeared to have been very much impressed by Mr. St. Gaudens's works, argued at the general meeting that he was becoming so famous that a monument now made by him for fifty thousand dollars would some day cost a hundred and fifty thousand; but this aspect of the matter was quite lost upon his fellows, who gave much more attention to the remark of Mr. Alderman Beebe, that the payment to Mr. St. Gaudens of the sum which he demanded for a sketch would "eat up" one-quarter of the funds available to pay for such work. Other gentlemen concurred in thinking that it was best to avoid further expense, and perhaps disappointment. Mr. Matteson thought that "people who had the higher ideas of art" might not be satisfied, but that the mass of the populace would be contented with one of the designs already received. Alderman Benzinger said that either the design "Postage-Stamp" or "Excelsior" was good enough for him or for the people of Buffalo. He had travelled extensively about the country, and in almost every town and village he had seen soldiers' monuments "sticking out of the ground," and felt that it was time to have one sticking out of the ground in Buffalo. Several of the committee expressed their fear that it "would not be safe" to consult Mr. St. Gaudens, and a ballot was finally taken, which resulted in the unanimous adoption of Mr. Keller's design.

THE people of Newark, N. J., seem to be determined to stop the pollution by manufactory refuse of the water that they drink. The suit against the Kingsland paper-mill proprietors was decided in favor of the city, notwithstanding the remarkable claim of the defendants, that the carbolic acid which they discharged into the stream tended to purify rather than defile it; and there is no reason to doubt that a similar verdict will be rendered in other cases of the same kind. The manufacturers on the Passaic resent this interference with their business, and some of them threaten, if indictments are found against them, to close their establishments, dismiss their hands, and remove to another State. As this would involve the sacrifice of the property invested in their mills, as well as a serious interruption to their trade, it is hardly likely that the threats will be carried out, and if they should be, neither Newark nor Paterson need stand in much fear of the consequences. One theory which will be advanced in defence of the mills is that the Passaic, being a navigable stream nearly as far as Paterson, is not within the jurisdiction of the county courts, but forms a part of the territory subject only to the Admiralty laws of the United States. Whether there is any reason in this claim the court alone can decide; but the people of Newark can be sure of obtaining justice by some means, if they will only persist in their endeavors.

A NEW system of electric fire-alarms has been introduced into certain districts of London. In place of the locked signal-box, the key of which must be sought for, often at serious loss of time, each station is furnished with a small cast-iron column, or post, having a glass pane set in the head, under which is seen an ordinary push-button. In case of the breaking out of a fire, the person who first observes it has only to run to the signal-post, break the glass, and press the button with his finger, until an answering ring from the central office tells him that his call has been received and understood. At the same moment the police are notified, and the extinguishing apparatus of the district is called out. It is said that in the limited territory where the experiment has been tried it has proved very successful, the saving of time in giving notice of fires being of great service in any effort to extinguish them. Some of the American cities, with the same object in view, have provided unlocked signal-boxes in the more important districts, which open by the simple turning of a handle; and it does not appear that false alarms are made any more frequent by the unrestricted access to the boxes which is thus offered to malicious persons. On the contrary, the multiplication of locks and bars seems rather to tempt the ingenuity of the vicious, and in any case it is doubtful whether the gain of time in checking fires before they gain headway is not sufficient to offset any probable annoyance from unnecessary calls.

GENERAL DI CESNOLA, who is expected to return to New York about the first of October, is said to have secured for the Metropolitan Museum, through the liberality of a citizen of New York, a fine collection of ancient glass, now at St. Germain-en-Laye. If this intelligence is confirmed, New York may congratulate itself upon the acquisition of a veritable treasure. There are, perhaps, no other antiquities which combine archæological with artistic interest in so high a degree as those of glass, whose infinite variety of form, color, and decoration reveals to us the mental quality of their makers, as well as the habits of those who used them. Every one does not realize the fact that the Romans, for instance, used glass in a greater number of forms, and for more purposes, than we do; so that we can learn more about their modes of life from the study of antique specimens than could possibly be inferred by our descendants from observation of the vitreous manufactures of our day. The Egyptians employed the same material in ways almost as various, although different; while the beauty of the Egyptian glass is almost unrivalled in modern times. The Venetian products of the sixteenth century, of which it is probable that the St. Germain collection mainly consists, form perhaps the most charming and instructive examples of the minor arts which we have, and a good collection of these would be worth many times its weight in gold to the glass-workers, jewellers, and designers of New York.

Two theatres, one in London and the other in Prague, have been totally destroyed by fire within a few weeks, burning with a rapidity which would not discredit an American conflagration, and there are many other indications that the solid character of European construction has of late years been greatly changed. At a recent fire in Paris, which broke out in what we should call a dry-goods store, occupying the ground floor of a large *maison-à-loyer*, or apartment-house, the fire spread so quickly to the rooms above that the inmates were unable to escape, and although as many as possible were rescued by means of ladders placed at the windows, many others perished before help could reach them. This account, which much resembles that of the burning of the Printemps, last spring, gives an idea of Parisian building very different from that conveyed by the tales which were related to us seven or eight years ago, about the tranquillity with which the lodgers in the upper stories of such structures were accustomed to gaze from their windows upon the operations of the *sapeurs-pompiers* engaged in putting out a fire in the rooms below them; and notwithstanding the stone staircases and deafened floors which are still habitual in French constructions, it seems certain that some vicious modes of building are gradually coming into use.

TWO remarkable scientific announcements have been made within a few days, one of which has a certain resemblance to the description of the Planté-Faure secondary battery, and is probably expected to derive a reflected brilliancy from the renown of the greater discovery. According to the "Scientific and Useful" column of the *North American Manufacturer*, an apparatus has been invented which will "store heat" in concentrated form, to be drawn upon as required. This device consists of a box filled with plates of a "composite metal which has a remarkable affinity for heat without melting," and is put in operation by placing the plates upon "protectors" consisting of "fine silk saturated with a preparation of liquid oxygen," and exposing them to the sun's rays, concentrated by a lens. "As soon as the requisite degree of heat has been attained," another cover of saturated silk is put over them, and they are returned to the box. Although the plates are supposed to be composed of a "fusion" of platinum and iridium, and liquid oxygen is a substance which until within a few months had never been obtained, the process is claimed to be "easy and inexpensive." Another product of modern science which deserves to be exhibited with the platino-iridium plates soaked in liquid oxygen, is the "new metal" of which it is said that pipes for the conveyance of underground telegraph-wires are to be made. This valuable substance is "composed almost entirely of pure carbon," is very light, being only about one-sixth the weight of iron, is indestructible, unaffected by heat or frost, and a perfect insulator, and is of a semi-elastic character, adjusting itself to the movements of the ground caused by frost. Such a metal as this ought to be applicable to other uses besides the manufacture of tubes for telegraph-wires. We might suggest that railroads, rolling-mills, foundries, machine-shops and engineering establishments have long been in need of just this material, and the secret of its manufacture should immediately be revealed.

A CASE involving the responsibility of architects is discussed in the current number of *La Semaine des Constructeurs*. A certain proprietor built a house adjoining another already standing, placing the work in the hands of an architect, who was enjoined to take any measures necessary to prevent damage to the neighboring estate. The needful precautions were, however, neglected, and the wall suffered some injury, so that its owner brought a suit for redress against the proprietor of the new building. He, in his turn, demanded indemnity from the architect, who sought to defend himself on the ground that he was not paid the full ordinary commission of five per cent. M. Ravon, in his comments upon the case, points out that the inadequacy of the architect's compensation does not free him from the consequences of his ignorance or carelessness. The law provides that one who renders gratuitous service shall be held to a less rigorous accountability than if he received compensation, but gives no immunity whatever to a person who consents to accept a reduced fee. As to the merits of this particular case, no opinion could be given without a knowledge of all the circumstances, — whether the injured wall was so weak or decayed that the legitimate superposition of masonry upon it would cause settlement; whether the injury was one of real gravity, or only a fancied grievance, and other matters; but that the inadequacy of an architect's fees does not lessen his responsibility in case of any mishap occurring through his fault is a principle which should be borne in mind by young practitioners, who are rather apt to forget that the mere covering of a certain number of sheets of paper with drawings is the smallest part of the duty and responsibility which is liable to be required of them.

THE CONSTRUCTION OF LIBRARY BUILDINGS.[1]

THE subject of library architecture came up for consideration at the last meeting of this association in Boston by having our attention directed to the construction of larger buildings than we have had experience with, of which several will be built in this country during the next five years. There was no time for a thorough discussion, and it was by common consent agreed that the more deliberate consideration of the subject should be resumed at the Washington meeting.

In the course of my remarks on that occasion, in which I made some suggestions as to the construction of this class of buildings, I said: "I know of no better rule to be observed in the library architecture of the future than this: avoid everything that pertains to the plan and construction of the conventional American library building." My present purpose is to explain and illustrate what I then could treat only in outline, and do some construction on my own account. I am convinced that the conventional style of library architecture is very faulty, and that we shall never have a general reform until better principles are applied to the construction of the largest buildings. The smaller libraries are constantly copying and perpetuating the confessed faults and worst features of the large libraries.

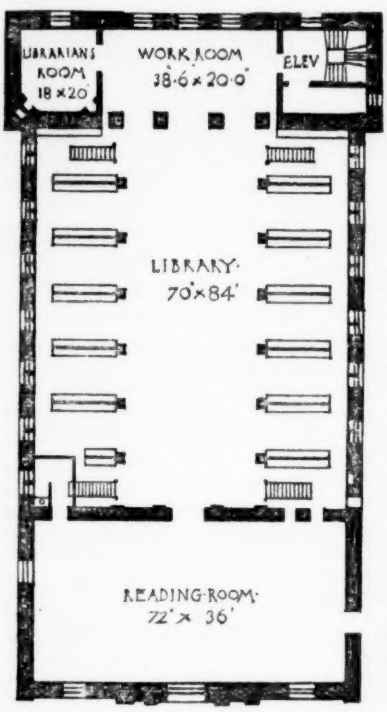


Fig. 1.

By the "conventional American library building" I mean the style of which the Boston Public Library, Boston Athenæum, Astor Library, Cincinnati Public Library, Baltimore Peabody Institute, Library of Congress, and others which I might mention are the representative types. All these buildings have lofty rooms and a large open space surrounded with alcoves and galleries which are used for the storage of books. Although these buildings have a variety of detail in other respects, this is the conventional style of which I speak. I might illustrate what I have to say by exhibiting the interior view of any one of them. I have selected, however, for this purpose the latest, the best, and the most carefully planned of all these buildings, — that of the Peabody Institute of Baltimore. Here some of the objectionable features of the older buildings have been avoided and useful appliances and devices have been introduced. It is, however, with the general plan we are now concerned.

The main library hall, of which I show you a ground plan (Fig. 1) and an interior view is 84 feet long, 70 feet wide, and 61 feet high. On the front is the reading-room, 72 by 36 feet, and in the rear a work-room, 38½ by 20 feet, and the librarian's room, 18 by 20 feet. The alcoves are six stories high; they project 18 feet from the walls, and there is a passage-way 2 feet wide next to the wall, for access between the alcoves, which are 12 feet apart. A skylight in the roof and two small windows in each alcove furnish ample light. The present shelving capacity of the room is 150,000 volumes. It is certainly a stately and imposing structure: and if we will banish from the mind all considerations of convenience, utility, and economy, and regard its architecture simply as an æsthetic recreation, we may pronounce the picture before us beautiful. It is the nave and aisles of a Gothic church of the Middle Ages, with the classic associations of five centuries about it, brought down to the practical uses of a modern library structure.

There are some objections to this venerable and conventional arrangement, and I will mention: —

1. The wastefulness of space in this central portion of the building. Books are shelved only in the aisles; the nave is empty, and serves no other purpose than contributing to the architectural effect. Is not this an expensive luxury? Here is a solid block of vacuity, 84 feet long, 34 feet wide, and 61 feet high — more than half the capacity of the room — which can be applied to no possible use in the storage of books. The floor can be used, and is used in most of the libraries of this class, as a reading-room and as a general promenade for tramps and sight-seers. It is unfit, however, as we shall presently see, for a reading-room, and the trustees of the Peabody Institute have had the good sense to provide another and suitable room for this purpose. The storage of books, therefore, is the only practical use to which this room is applied, and half its capacity is wasted in order to secure architectural effect.

2. The second objection I will mention is the difficulty and expense of heating such a room as this. In our northern climate fires are kept for six or seven months of the year, and for four of these months large fires. Hot air from a register or radiator rises to the ceiling like a balloon, and the upper strata become intensely heated before the lower stratum, in which we live, has a comfortable temperature. This arrangement is a wasteful expenditure of heat. In the Cincinnati Public Library the unequal distribution of heat is partially obviated by warming the marble floor by means of steam-pipes beneath the floor, and drawing off the heated air of the upper galleries by ventilation or cooling it in the lantern of the roof, which in winter serves as a refrigerator. This is done, however, at an enormous expense for fuel. The librarian informs me that five hundred tons of coal are consumed in the library furnaces in an average season. He has sent to me tests of the temperature in different parts of the library, which he made on December 29, when the thermometer outside indicated 3° below zero, and also on the evening of January 4, when 120 gas-lights were burning, which indicate that the temperature on both occasions was fairly equalized. Four years ago a friend of mine visited this library, and, observing the intense heat in the upper galleries, procured a thermometer and ascertained the temperature near the floor and in the upper gallery. Six feet from the floor it was 65°, and in the upper gallery 124°. Mr. Dyer, librarian of the Mercantile Library of St. Louis, writes to me, under date of February 3, 1881, that the temperature of his library-hall on that day, one foot above the floor, was 64°; 10 feet above, 74°; 19 feet above, 82°, indicating that the increase of heat was about one degree for every foot of elevation. He adds that, during the summer, the mercury, two feet below the ceiling, frequently reaches 140°.

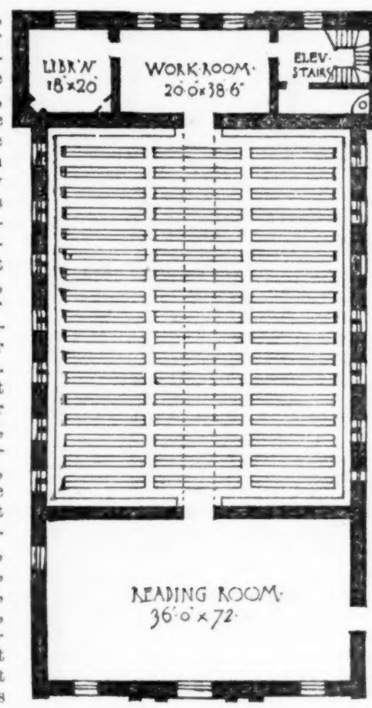


Fig. 2.

3. I object, in the third place, to the shelving of books in galleries *under any circumstances*, and especially in this instance, where the alcoves are piled one upon another, six stories high. I may group my objections under three heads: —

(*a*) Because galleries are a wasteful expenditure of the physical strength of attendants in climbing stairs and of the time of readers in waiting for their books.

(*b*) Because the bindings of books in galleries perish from heat, and the higher the books are above the floor, the more active is this destructive agency. Leather is an animal tissue, and will not, like linen, cotton, paper, and other vegetable substances, sustain without injury a higher temperature than we find agreeable to ourselves. Books cannot live where men cannot live. They are more nearly allied to us as congeners than we are wont to suppose. In excessive heat the leather of bindings slowly consumes and its life departs. If we put our friends in torment, they prove to us the doctrine of annihilation. Bindings perish from other causes, one of which is the presence of sulphuric acid in the leather. This acid is used in a process of the manufacture called "clearing," and from haste or negligence is not thoroughly extracted before the leather is finished. The sulphurous residuum of gas combustion is also said to be injurious to bindings. The burning of gas, I have no doubt, is very injurious to bindings in libraries of this construction, and chiefly because it raises the temperature in the galleries. In libraries bindings have no such aggressive and destructive an enemy as excessive heat. All the large libraries in this country and in Europe are lamenting its ravages, and often without a suspicion of the real cause of the deterioration. A well-known architect of Boston recently called upon me, and, conversing upon this subject, which was new to him, said that he frequently went into the galleries of the Boston Athenæum to consult books, and when he came down found his clothes covered with a fine red powder. He asked if I knew what that powder was. I replied that I had often observed the same fact in the same locality, and I had no doubt that it was the *ashes* of the bindings, which had been consumed by excessive heat.

Books should, therefore, be shelved in the coolest part of the room, where the air is never likely to be overheated, which is near the

[1] A paper by William F. Poole, Librarian of the Chicago City Library, read at the late Convention of Librarians, held at Washington, D. C.

floor, where we ourselves live and move. In the private libraries of our residences a mistake is often made in carrying the shelving of our book-cases so high that they enter the upper and overheated stratum of air. If any one be sceptical on this point, let him test, by means of a step-ladder, the condition of the air near the ceiling of his common sitting-room on a winter evening when the gas is burning freely. The heat is simply insufferable.

(c) Besides the reasons already given, I object to the shelving of books in galleries because it is unnecessary. The 150,000 volumes, the present capacity of the Peabody Institute Hall, can all be shelved near the floor, where convenience in reaching them and their preservation require them to be. In order to exhibit this fact to the eye, I ask your attention to this scale drawing of the floor (Fig. 2) with the book-cases so inserted. The folios and quartos will be shelved in wall-cases extending around the room, and the royal octavos and smaller volumes in double cases, open on both sides, three feet apart, the side alleys being three and a half feet wide, and the central alleys four feet wide. Instead of having two alleys four feet wide, the better arrangement for this room would be to have a central alley five feet wide, which would give direct communication with the reading-room from the work-room and librarian's room. The cases will not be so high but that a person of average stature can reach any book without step or ladder, say seven and a half feet.

The rule for estimating the shelving capacity of any room of considerable size arranged in this manner is to allow 25 volumes for each square foot of flooring. In this instance the capacity is 27 volumes per square foot, because the cases are longer than they are usually made. The shelving capacity of these cases is 160,050 volumes.

As I am to use further on, in some construction of my own, the estimate that each square foot of flooring will shelve 25 volumes, I will here explain how it is obtained. The double cases are 18 inches wide and of any desired length, say 16 feet. The space which one case will require is a rectangle, of which the longer side is the length of the case plus the width of the alley (usually 4 feet), or 20 feet. The shorter side is the width of the case (18 inches) plus the distance between the cases (3 feet), or $4\frac{1}{2}$ feet. One case, therefore, requires 90 square feet of flooring. The area of shelving on one side of the case is 16 by $7\frac{1}{2}$, or 120 square feet; on both sides, 240. The conservative rule usually adopted for estimating shelving capacity for books of all sizes which go to make up a general library is 10 volumes for each square foot of front area. The capacity of the case requiring 90 square feet of flooring is, therefore, 2,400 volumes; and one square foot will shelve 26.6 volumes. Twenty-five volumes, therefore, to the square foot is a reasonable estimate.

By reducing the width of the alleys from 4 to 3 feet, and the distance between the cases from 3 to $2\frac{1}{2}$ feet (in the stack-room of Harvard College Library the distance is 2 feet 4 inches), the shelving capacity could be considerably increased. I have preferred to allow liberal spaces between the cases, and not to force the principle of contraction to its utmost limit. The estimate of 25 volumes to each square foot applied to large rooms brings out such enormous results as to be almost incredible.

We have now, in theory at least, shelved all the books which these six tiers of alcoves will contain upon the floor, and have space for 10,000 volumes more. We have also, overhead, 61 feet of air and light, which is more than we need. Sixteen feet is better than 60, for it is enough. Three other floors, each of the same capacity, the rooms being 16 feet high in the clear, would fill the 61 feet and about 9 feet more. In the three upper stories the space which on the lower floor is appropriated to the work-room and the librarian's room could be used for book-cases, and would shelve 76,800 volumes. The entire storage capacity of the building would therefore be 717,000 volumes. This arrangement, when the library comes to need so much shelving space, would allow of a classification of its books into four grand divisions or departments of knowledge, each one of which would have a floor and reading-room to itself. The reader, then, by means of a modern elevator, would go directly to the floor on which the books in his own range of study are stored.

4. Returning to my general series of objections to the conventional style of library architecture, I mention, in the fourth place, the difficulty of getting about from one part of the library to another. Not to speak further of the burden of climbing stairs, it is necessary, in order to move from one gallery to another on the opposite side, to travel on the outer edge of a parallelogram, when the economies of locomotion require that we move as nearly as we can in straight lines, and from the centre outwards. Observe the ease with which any case of books can be reached on this floor plan and the difficulty in the conventional plan of passing from a lower alcove to one in a remote corner of the upper gallery. In a popular circulating library it is positively cruel to send attendants for books with such an arrangement for shelving as this; and to station them in the overheated and stifling air of galleries to answer calls for books is even more inhuman.

5. I object, in the fifth place, to this plan of construction, on account of its insecurity from fire. In an interior finished with wood, no arrangement could be more skilfully devised for favoring the destructive operations of fire than a series of alcoves piled one upon the other six stories high, with every facility for draught — unless it be a pile of empty packing-cases. When a building of this kind takes fire the work of the insurance adjuster is very simple, for it is a total loss of the whole library. Water, heat and smoke are as fatal to books as fire itself. The Library of Congress has twice been burned; Harvard College Library, once; so also the Chicago Historical Society's Library, in what was thought to be a fire-proof building; and the Birmingham Free Library, which several of us visited little more than three years ago, has since, with its great Shakespearean and Cervantes collections, been burned with fire, and nothing of its more valuable treasures saved. The class of library-buildings which we are now considering will contain books, manuscripts, and public records of inestimable value which money cannot replace. To lose one of these libraries by fire would be a national calamity. After all that may be done in the way of external protection, there is still a large risk from internal accidents.

On a summer evening, a few years ago, a fire broke out in one of the rooms of the Cincinnati Public Library after the building had been closed for the night. It was fortunately discovered and extinguished before much damage was done. The origin of the fire was at first a mystery; but it soon appeared that the painters, who had been finishing the wood-work of the room, had left their oiled rags on the ledge of one of the book-cases when they quit work at night, and these had ignited by spontaneous combustion and had set the book-cases on fire. The Birmingham Library was set on fire in the daytime by the lamp of a careless plumber who was thawing out the gas-pipes. A fire may start in a large library at any time by accidents as unusual as these; and it were a shame if, from errors of construction, it be allowed to range through the whole building. Hence, buildings such as we are considering should be constructed in a series of fire-proof compartments, in order that the fire may be confined within narrow limits. I am not aware that this precaution ever has been taken. The principle, however, has been applied to the great ocean steamers, and many a ship has been saved by having its hull divided into several water-tight compartments. A practical method of securing this protection will be considered later in our investigation.

6. In all the libraries of this class in our country, except the Peabody Institute, the open space in the nave of our old Gothic church is used as a general reading-room; and in the Peabody Institute, where another reading-room has been provided, tables have been placed in front of each alcove, cutting off public access to them, at which students may study if they choose.

There are several objections to the use of this open space for that purpose. It is too public and bustling a place for quiet study. Here the business of the library is done. Readers are applying to the custodians for books, and attendants are running about on the marble floor, delivering their orders and taking new instructions. The emptiness overhead is appalling. Crowds of visitors and sightseers are marching by, admiring the architecture, expressing their views on what they see, and asking each other in audible tones if they suppose the librarians have read all these books and know what they contain. One engaged in study hears remarks which were not intended for his ears and sees sights which distract his attention. I said at our meeting in Boston: "It is like attempting to study in Scollay Square or on a mall of Boston Common." Those of you who have visited the reading-room of the British Museum will remember the strict precautions which are observed to secure perfect quietude in that sacred precinct. Applications for books are made in writing; and if it be necessary for readers to speak to the attendants, the conversation is in a tone so subdued that no reader can hear it. No person can enter the room unless it be for study, and he must show his ticket. The American librarians who, three years ago, were the guests of Mr. Garnett, the superintendent, were taken to an elevated position overlooking the floor, and the details of the arrangements were explained in whispers.

7. The seventh objection I will mention to this style of architecture is the difficulty of enlarging it. How is this building to be enlarged when the growth of the library demands an extension? Shall it be extended heavenward, and more galleries be piled on these, with more wasted space in the nave, greater difficulty of access to the books, and more extravagance in the heating? Shall transepts and a chancel be built, so that the plan will represent the true ecclesiastical cross? However pious these improvements and gratifying to the taste of the refined architect, they are expensive, they involve demolishing much that has already been constructed, and they will give but little additional room. Why library architecture should have been yoked to ecclesiastical architecture, and the two have been made to walk down the ages *pari passu* is not obvious, unless it be that librarians in the past needed this stimulus to their religious emotions. The present state of piety in the profession renders the union no longer necessary and it is time that a bill was filed for a divorce. The same secular common sense and the same adaptation of means to ends which have built the modern grain elevator and reaper are needed for the reform of library construction.

Any plan for library construction is faulty which does not foresee and provide for future enlargement. The Boston Public Library, with a building like this, has for ten years been struggling with the problem of enlargement, and has at last solved it by resolving to abandon the building and the site with all the ingenious devices and expensive improvements made upon the premises during the past quarter of a century. Last winter the City Council of Boston petitioned the Legislature of Massachusetts for the gift of a block of land in the Back Bay District for the Public Library, and the petition was granted. Much trouble and expense had been saved if the hopeless and temporary schemes of enlargement, such as dividing the alcoves by double book-cases, had been abandoned years ago. There is probably no library-building in the country which has been so much admired (by non-residents) as that of the Boston Library, and none whose worst features have been so generally copied by the smaller libraries. The Astor Library makes its enlargement by erecting another and similar building on an adjacent lot. Its third building is now in process of erection.

The trustees of the Peabody Institute have provided for the increase of its shelving capacity in the same manner as was done in Boston, by dividing its alcoves with double cases. In anticipation of this change two small windows for each alcove were originally made in the side walls, which will light both sides of the double cases when they are built. It is obvious that this arrangement will be a blemish to the architectural effect of the interior. These many windows serve in winter, by their leakage and radiation, to reduce the excessive temperature of the upper galleries; but it is done at an enormous waste of heat.

8. My eighth objection to this sort of library construction is its great cost, compared with a simpler, less pretentious, and more convenient style. The inclosure of so large and high a room as this requires that the outer walls, the girders, and the roof be of unusual weight and cost. The lantern or skylight in the roof, which ought to be wholly of iron and glass, is expensive. The structure whose plan is before you cost $342,000, which includes the cost of two lecture-rooms beneath, and two art rooms above. The Boston Public Library building cost $325,000. The Cincinnati Public Library, with a capacity of 250,000 volumes, cost $350,000. The two structures of the Astor Library, and the third not yet completed, all with a capacity of 300,000 volumes, will cost $398,000. It is a practical question, allowing the plans of these buildings to be the best that can be devised, whether these are not too large sums to be expended for such limited accommodations. Is it not lavishing upon the casket what ought to be spent on the jewels?

I will not detain you longer in discussing this part of my subject. I think I have said enough to justify the statement with which I started out, that I know of no better rule to be observed in the library architecture of the future than this: Avoid everything that pertains to the plan and construction of the conventional American library-building.

Up to this point I have freely passed judgment upon the plans and buildings of others. I am now to do some construction of my own. "It is easy," says the old proverb, "to criticise: it is not easy to construct." I have no pride of opinion that can be wounded by any strictures which may be made upon my plans. I offer them to be criticised. My only purpose is to secure better principles in our library architecture, and this can best be done by a free interchange of opinions held by practical librarians. I therefore cordially invite any librarian, architect, or other person present, whose building or plans I have criticised, to take his full measure of revenge upon my work when I have concluded.

In the plans I now lay before you, I propose, on a lot of ground 200 feet square, the construction of a building for a reference library of 1,000,000 volumes; and, in order that the library may grow, I expect, upon the same lot, without cramping the space for storage or changing anything that has been constructed, to provide for 2,000,000, and later for 3,000,000 volumes. By doubling the size of the lot to 400 by 200 feet, 6,000,000 volumes can be provided for. It is proposed to erect no more of this building than is needed to meet present wants, and that additional compartments of similar construction shall be built from time to time as they are required. In devising this plan I have sought to secure the following results: —

1. That the building shall be constructed in compartments and as nearly fire-proof as is possible, so that, if fire starts, it shall be confined in the compartment in which it originates and the rest of the library be saved.

2. That waste room shall be reduced to a minimum; that convenience and utility shall never yield to architectural effect; and that the building shall be easily and economically heated.

3. That more spacious and convenient quarters than we now have shall be provided for the administrative department and the working-rooms of the library.

4. That there shall be no climbing of stairs for books and no overheating of bindings in galleries.

5. That greater facility of communication between different parts of the library shall be secured, and that the books shall be shelved near the floor, and no higher than they can be reached without step or ladder.

6. That quiet accommodations shall be provided for readers; that separate rooms be assigned to special subjects and furnished with such special arrangements as they need for their storage and use.

7. That the cost of construction shall be kept within reasonable limits; and that convenience, utility, and economy shall be the controlling principles in the design.

I do not claim that my plan is the only one that will meet these requirements; but simply that it is one such plan; and, if it serves no other purpose, it may suggest a better design. It has at least the novelty, if not the merit, of being a radical departure from the beaten track.

My first requirement is a lot of ground 200 feet square, surrounded on all sides by streets, or, what is better, by other open space. On the middle of the side most appropriate for the main entrance I place the central building, 60 feet front and 75 feet deep, which will be wholly devoted to the administrative superintendence and work of the library. Here will be the offices of the librarian and heads of departments, the catalogues, the most general works of reference, and here the business of the library will be done. Here will be apartments for the cataloguers and for unpacking and arranging books. The bindery will occupy the upper story.

The books will be stored, not as now in one general repository, but in a series of rooms thrown out as wings from the central building, and extending around the lot. These rooms will be 50 feet wide, 16 feet high, and as long as it is convenient to make them. The width of the wings will be determined by the space that can be well lighted by side windows and that can be spanned by iron girders without pillars. Ten of these rooms are indicated on the plan

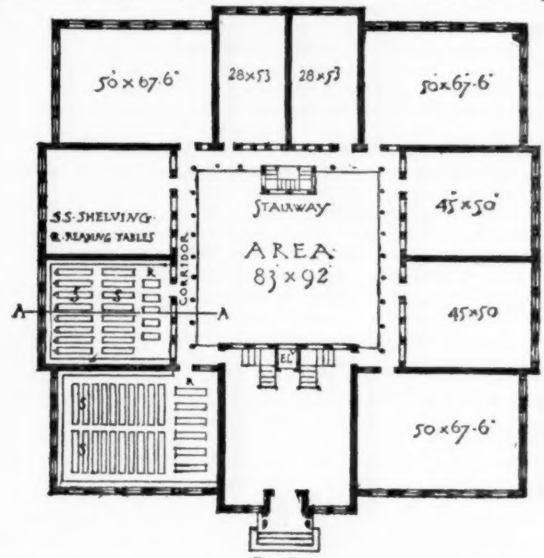


Fig. 3.

before you, and, carrying the same construction four stories high, there will be forty of these rooms in the whole structure. Each of the rooms will contain the books on some special subject, or, in the early stage of growth, several related subjects. One room will be devoted to the fine arts, and will have the proper cases, tables, and other appliances for shelving and studying the large and expensive illustrated works which belong to such a collection. Another room will have the mechanic arts, with such other arrangements as are required. Another room will contain history, and, when the library has grown to a million volumes or more, perhaps American history only. Political economy and social science will be found in another room, and so on through the different classifications of knowledge. These rooms will have no alcoves nor galleries, for alcoves I regard

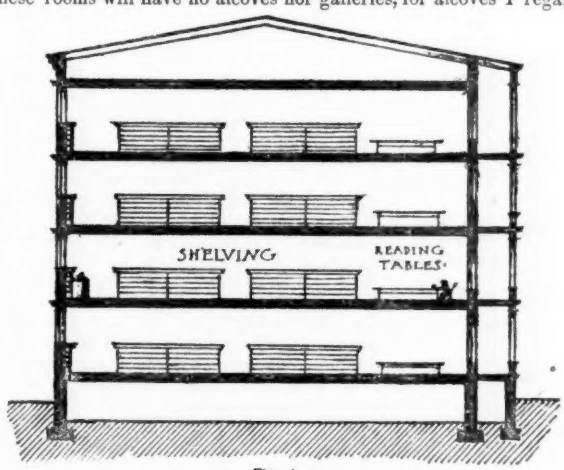


Fig. 4.

as useless and galleries an unpardonable nuisance. The books will be shelved in wall cases and double cases not higher than a person can reach. The plan of shelving the books is the same which I have already described in speaking of the floor plan for the Peabody Institute. High light will be taken on the exterior side from windows above the wall cases. Each room will have light from two sides, and will be furnished with tables, chairs, and all the conveniences for quiet study. The reading-desks will be on the inner side where there are no wall cases, and hence the windows looking into the quadrangle will be of full length. The attendant in charge will have an opportunity to become acquainted with the books in his department and competent to assist readers in their investigations.

The following suggestions are the result of over twenty years of practical experience and observation. Thoroughly familiar with

There is, therefore, no occasion or need of a general reading-room other than the one in which are kept the encyclopædias, dictionaries, and the general works of reference. Special dictionaries may be shelved with their own departments, and to some extent general works of reference may be duplicated. When it is necessary, books can be loaned from one department to another, as they are now sent to the reading-room. The building will be supplied with telephones and all the modern appliances for communication. As a general rule, readers will go to the room which contains the class of books which they wish to study.

As a protection from fire, each room used for the storage of books is cut off from every other room by a brick fire-wall extending through the roof. The only access to these rooms will be by a light iron corridor at each story, seven feet wide, running around on the inside of the quadrangle, as indicated on the plan (Fig. 3). In winter these corridors may be inclosed by glass windows, which can be removed in the summer. The long windows in the quadrangle will give abundant light, notwithstanding the small amount which will be intercepted by the corridors. Every floor will also be made thoroughly fire-proof. They will be laid on rolled iron beams supported by lattice girders, the space between the beams being filled with porous terra-cotta, and the beams will be covered with concrete, upon which the flooring will be laid. The girders will also be protected by an ornamental covering of terra-cotta, which will serve as a decoration for the ceiling of the room below. Without such covering, iron, in case of fire, is the most treacherous of all building material. If by accident fire should start in any one of these forty rooms, it could not endanger the safety of the other thirty-nine.

This arrangement of access to the rooms by means of corridors serves another purpose besides being a protection from fire. It is a protection against tramps and sight-seers, who would be marching in crowds through these wings if there were a passage-way through them, as in the Louvre at Paris. Such a passage-way would take up a good deal of room, would interfere with the arrangements for shelving the books, and would disturb the quietude which is needed for study. It is a delusion to depend on iron doors between the rooms as a protection from fire, for, in such an emergency, iron doors are always found to have been left open.

In the rear of the central building will be an elevator, which will land readers upon the level of any of the corridors. As the central building will not be used for the storage of books, it will have stairways, besides the elevator, for reaching its several stories. In case of accident to the elevator, the stairways can be used for access to the upper corridors. On the rear side of the quadrangle there will be a stairway connecting the several corridors. If time allowed I might speak of other details of construction.

We will now consider the storage capacity of this building, and first of a single floor. Deducting the space covered by the walls, there are 25,250 square feet of flooring in these wings. Deducting still further one-fifth of this space (or 5,050 feet) for the tables and

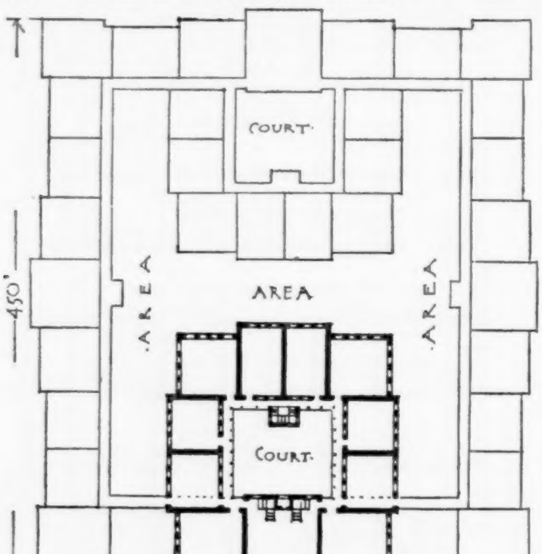


Fig. 5.

other accommodations of readers, we have 20,200 feet which can be used for book-cases. By the rule we have already demonstrated, that each square foot will shelve 25 volumes, we have for the shelving capacity of this story 505,000 volumes, and of the four stories, 2,020,000 volumes. The ceiling of the upper story is only 69 feet above the lower floor, and, if more space be needed, the walls may be carried two stories higher, which will give accommodations for another million volumes. The walls will then not be higher than many of the blocks in our commercial cities, which, by means of elevators, are used as business offices to their upper stories.

By extending the front wings 100 feet on each side and carrying them back to the rear line, leaving an area 50 feet wide for light and ventilation, we have accommodations for 3,000,000 volumes more, or 6,000,000 on a lot of 400 by 200 feet. By extending this construction over a lot 400 by 450 feet, as in the plan before you, we have a capacity of 12,000,000 volumes.

It is desirable for many reasons that a large reference library should be surrounded by wide open space and should be away from business centres. Such lots are not always available in a large city, and it is necessary to erect the building on a business block. A construction such as I have described is favorable for such a locality. A large number of volumes can be provided for on a lot of moderate size, and as a source of revenue the basement story could be used for business purposes. The building with its fire-proof construction would not be endangered in case one of the basement apartments should take fire. Whether it could live in such a furnace as the great Chicago fire is a question.

I have thus far considered only the wants of a reference library like the British Museum, the Astor Library, and the Peabody Institute. It may be necessary to provide also for a circulating department. One of these front rooms, which will shelve 67,500 volumes, may be used for this purpose. The circulating department may be located in the basement, whose storage capacity has not been included in our previous estimates. There is a clear open space in the quadrangle, nearly 90 feet square, for which no provision has yet been made. A one-story structure, lighted from above and covering this space, will not interfere with the light of the reference department. It will contain 120,000 books for circulation, with ample space for waiting and delivery rooms. Access to it might be had on the basement floor under the main entrance to the reference department.

One very important part of the subject remains to be considered, viz., the cost of the building. In this matter I have not ventured to trust my own judgment, and have relied wholly on the careful and detailed estimates of one of the most experienced and conservative architects in Chicago, Mr. William H. Wilcox, who has built many large structures, and is now building the State-House at Lincoln, Neb., which will cost $1,250,000. I have his estimates with me; and, as they are too long for me to read, I will only state the results.

The estimates are made on a building such as has been described, covering a lot 200 feet square, five stories high, including the basement, and having a capacity of shelving 2,000,000 volumes. The exterior will be of sandstone, in simple yet characteristic design. The building is to be absolutely fire-proof, with brick walls and iron beams, iron window frames and sashes, and steel inside blinds to all exterior windows. The interior iron-work will be covered with porous terra-cotta or other fire-resisting material. The floors in the book-rooms will be of hard wood, and in the vestibule and inside corridors of tiling. The walls of the same will be wainscoted in stone and tile. The cost of the building complete, including the steam apparatus for heating, but not including the shelving and furniture, will be $530,000. The shelving, which will be of hard wood, with the furniture, will cost $110,000, making the entire cost of the building in readiness for occupation $640,000. The cost of construction, on the basis of storage capacity, in the Boston Public Library is $1.30 a volume; in the Astor Library, $1.33; in the Cincinnati Public Library, $1.40; and in the Peabody Institute, $2. In the plan I have laid before you, the cost of construction, estimated on the same basis, is 32 cents a volume.

I will take no more of your time in presenting this subject, and shall now be happy to reply to any inquiries which may be made.

CEMETERIES REFORMED. — I.

God's Acre Beautiful, or the Cemetery of the Future, by W. Robinson, F. L. S., London, 1879, is the title of a book on cremation, handsomely illustrated.

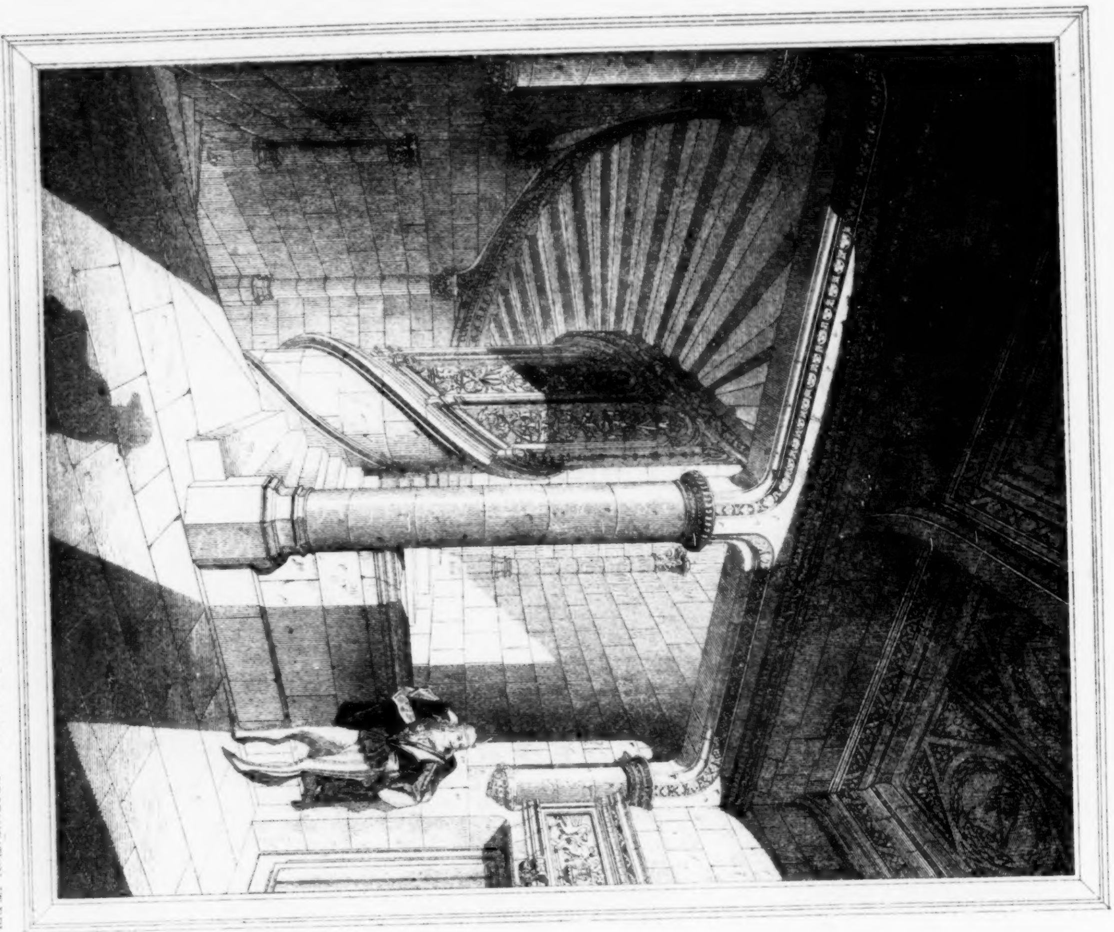
The eloquent writer has taken pains to unearth the full chapter of maltreatment of the dead for the past two centuries, showing all the horrors of over-crowded burial-places in large cities, and has tried to convince the public that the only remedy for the evil can be found in the erection of crematories.

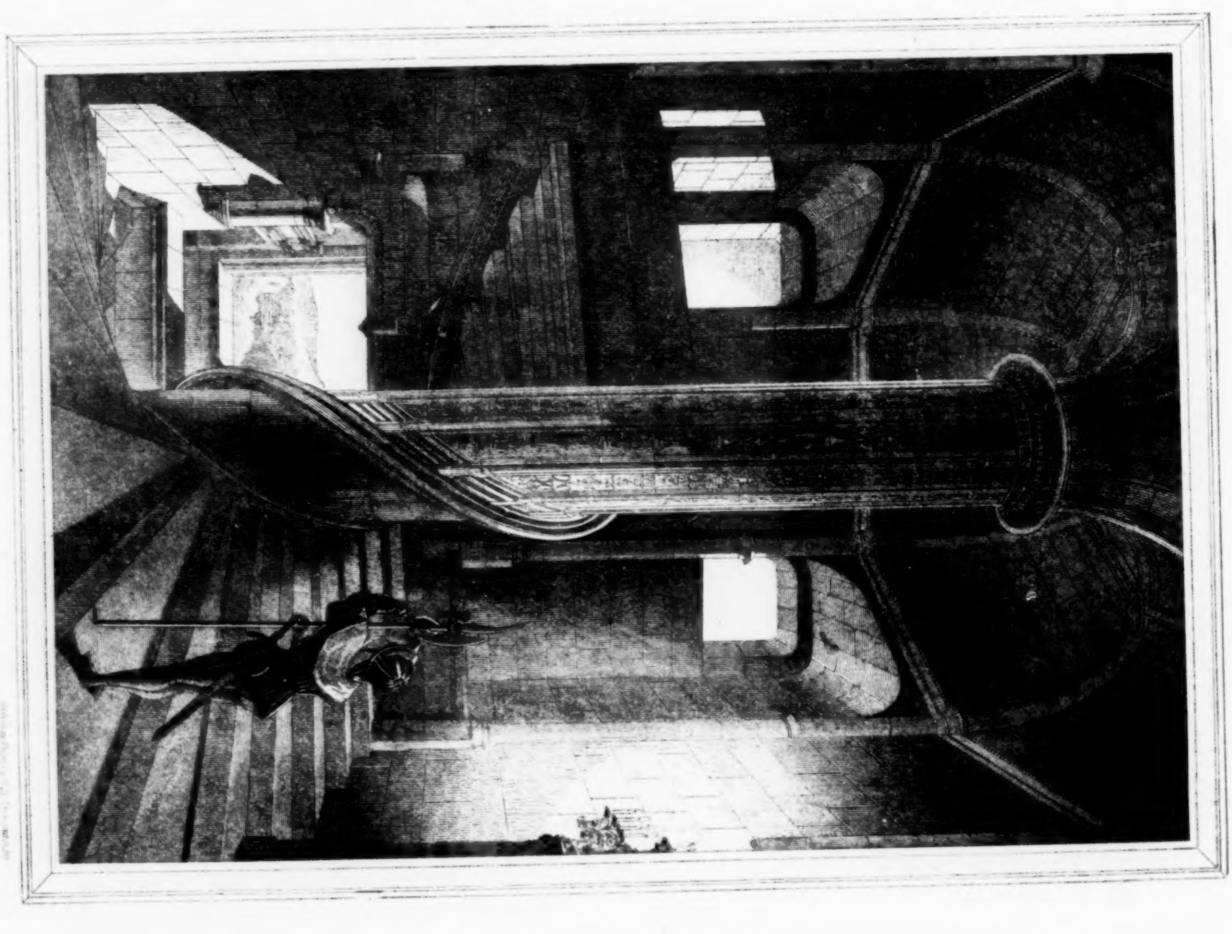
Decency and the want of suitable and convenient burial-grounds are the well-known reasons given by those who advocate cremation so strenuously. But neither the present generation nor the next will be prepared to go back to this old barbaric system, because it is against our religious feeling, and as Christ was laid in his grave, the Church will not change this sacred ceremony.

No thoughtful man can deny the danger of the present system for large cities, but between the present carelessness, and the process of cremation, we can resort to a reform which is not offensive, but, on the contrary, more conformable to advanced civilization than the present method. Science and art may in time discover a process to make the delicate question of decomposition in the grave more acceptable; but the standpoint we ought to take today is to reform the burial system, and bring it into harmony with our present state of education, so that in case a coming generation should favor cremation, the transformation from the system now suggested to that would be less objectionable.

The reform proposes, first, the centralization of cemeteries for large cities; second, an economical system of subdivision of the ground; and third, a much needed reform in our burial ceremonies at the grave.

Moniteur des Architectes

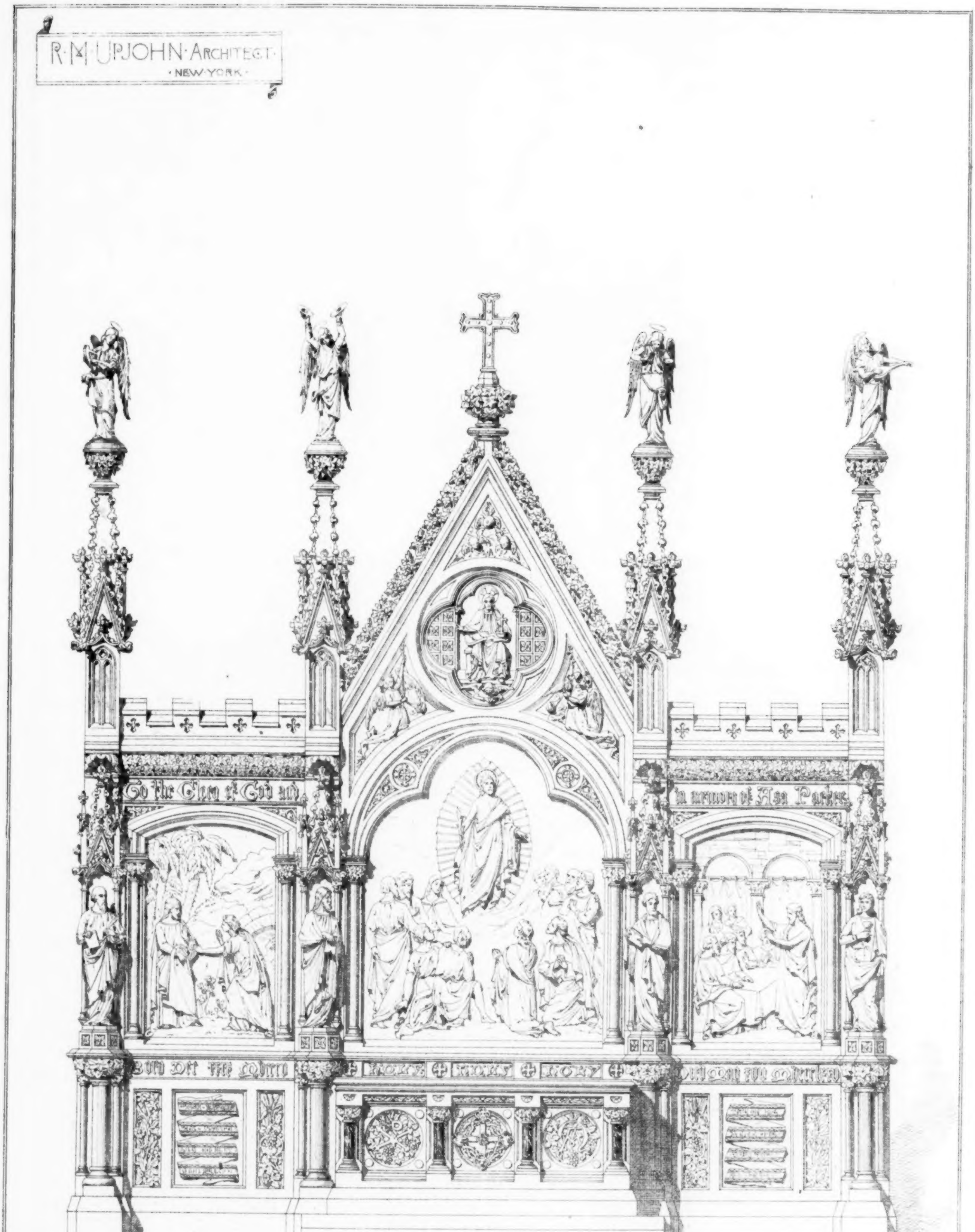




CHÂTEAU DE CHÂTEAUDUN RESTAURATION ET RELEVÉ DE L'ESCALIER DU CARDINAL DE LONGUEVILLE

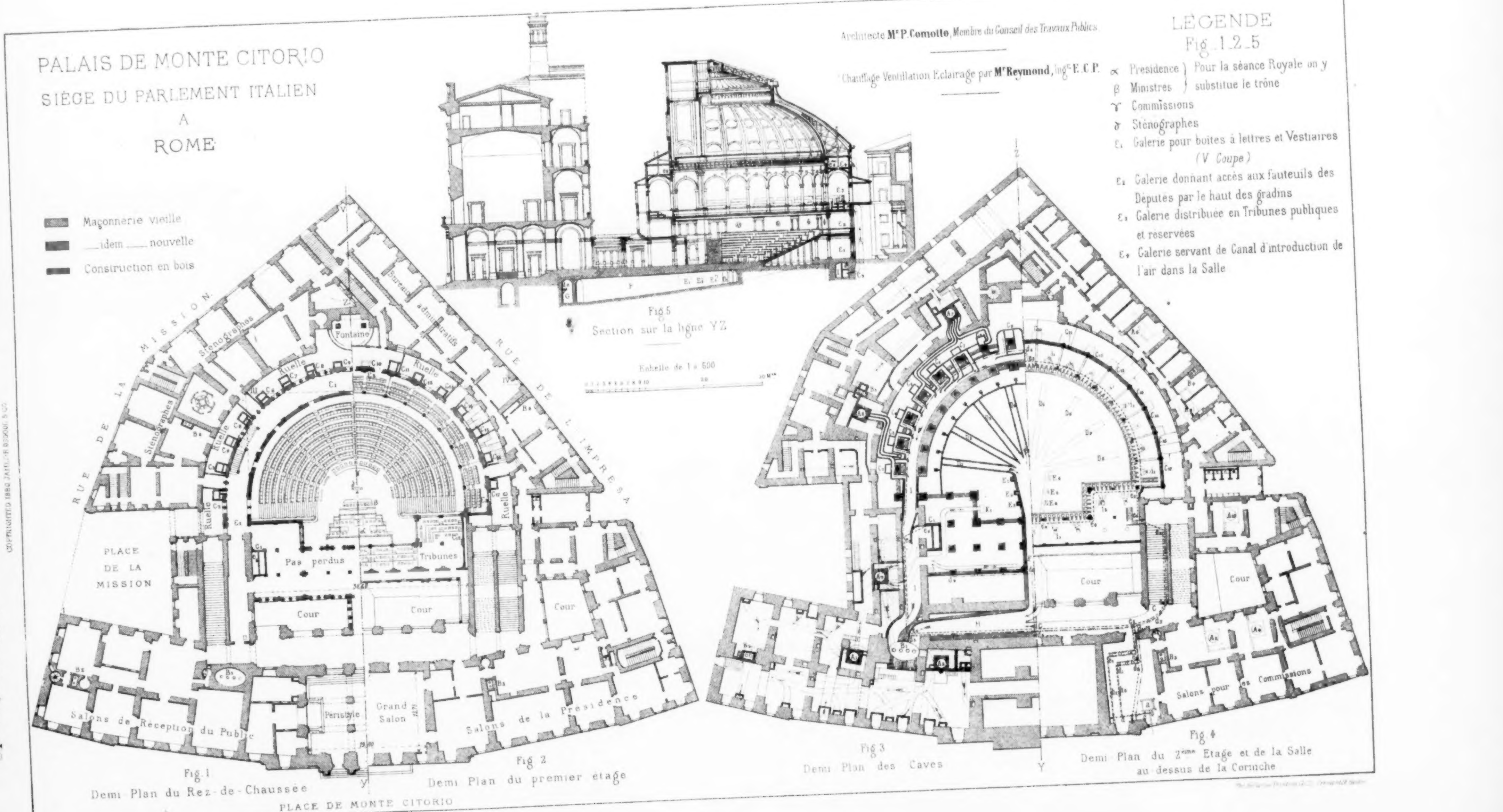
M. A. BOUDIER, ARCHITECTE

GRAY & PAGE, Architects. DESIGN FOR CHRISTIAN CHURCH. Washington, D.C.



Packer Memorial · St. Marks Church · Mauch Chunk Pa.

Le Génie Civil.



Le Génie Civil.

almost all the prominent cemeteries at home and abroad, the writer submits this matter to the public, knowing that a large majority of the people are averse to the subject as an unpleasant and disagreeable one, although its high importance must, nevertheless, be acknowledged.

CENTRALIZATION OF BURIAL-GROUNDS.

The recent census has again proved the steadily increasing tendency of the present generation to abandon rural life and to resort to large cities, where comfort and amusements of every description can more readily be enjoyed at moderate expense, and where opportunities to engage in the various branches of business for the gain and accumulation of wealth are more available. This rapid and disproportionate swelling of all large cities in the United States has caused the laying out of an unnecessary number of cemeteries in every direction, of which many are mere land speculations. It has become a public secret that the sale of cemetery lots in the vicinity of large cities is more profitable than any other form of land speculation; that in addition to a few acres of land nothing more than a fence and a charter are required to accomplish the scheme. Almost any tract of land not available at present for city improvements, when free from water and rock, is to-day considered fit for such a purpose.

The importance of centralizing burial-grounds is nowhere better illustrated than in and near the cities of New York and Brooklyn, where the adoption of a practical centralization plan would abolish serious defects caused by a system of scattered cemeteries, as, for instance, the indiscriminate consumption of valuable property which, in course of a few years, will be a drawback to future development of city improvement, and the reduction of the city revenues on account of large areas of cemetery grounds exempted from assessment and taxes, amounting already to over $600,000 annually. But the great obstacle for introducing a reform in cemeteries may be found in our own selfishness. Few can elevate themselves above the fact that the world has forgotten us long before we are reduced to dust, and that every interest for our grave has passed away with the friends buried at our side. A hundred years after we are laid under the sod no one but strangers may cast a glance at our weather-beaten and decayed monument, which then probably stands isolated among old trees and broken headstones. Another hundred years — the writer has not the courage to sketch the sight. In spite of all bequests and funds secured for taking care of the graves, little discoverable will be left. Time changes men and their intentions, — an everlasting title or possession is worthless.

Therefore, to do justice to ourselves, as well as to coming generations, we should not object to a reform which guarantees the preservation of the grave or family burial-place for all reasonable time.

In Europe, cities with twelve to fifteen thousand inhabitants have buried their dead for the past two hundred years on a five to six acre plot, digging grave by grave close to each other for man, woman, and child in due order, as their summons come to be carried out to "God's acre." They are buried in rows with no distinction whatever. No monument, no planting, except a fresh green turf-border and a few flowers; a black painted stake at the foot of the grave with a carved number on both sides is all that marks it, and when the last row is filled the grave-digger returns to the first again, and the bones which he finds in digging a new grave, he carries to the bone-house, built for the purpose in one corner of the lot.

If we follow the progress of improvements and the taste displayed in the management of cemeteries in this country, from the insignificant hidden church-yard to the present rural park cemetery, we observe indications of a strong inclination to seek prominence by owning large lots and conspicuous monuments, while not more than eighty years ago a space for three or four graves in a line with others was something unusual, and the family who secured them considered it a special favor of the church. Monuments at that time consisted generally of a simple head and foot stone, with rare exceptions a little square obelisk. The reason was plain; the church could not afford to give more space, and people were satisfied. But out of it sprang the necessity for establishing cemeteries at the outskirts of the city. They were at first exact copies of the old church-yard system, though the abundance of cheap land soon inspired to a change, and family lots were laid out which provided for all its members. Still our forefathers proved to be in this, as in all other things, plain and unassuming. No ground was wasted, even then; a picket fence surrounded the family graves of the richest.

Since that time views have changed. The larger the lot the better the family, and a forty-foot obelisk is supposed to prove more wealth than one of thirty-five; such are the lessons of our cemeteries. But let us reflect for a moment, and compute the acreage required by this method for the next fifty years only.

A quarter of an acre lot 100 by 100 feet is not very uncommon. It is generally calculated for a big monument, an effective background of large trees, and for ten or fifteen graves. Many lots of 50 feet square are laid out with no more than five to ten graves on them when the last of the family is buried. They were originally bought for the interment of three generations. At a fair average 125 square feet are consumed for each grave by our present family-lot system. Take New York, Brooklyn, and its suburbs for an illustration: they will have to bury not less than two million people during the next fifty years, of whom one million may be interred in family lots, the others in single graves of 30 square feet each. By this estimate over 3,000 acres are required for family lots only, and 750 acres for single graves, and the question must naturally arise, where and how shall New York bury its dead during the next one hundred years? A satisfactory solution of this question should interest every thoughtful man.

"Cremation" is not likely to prove acceptable with the American people, as their sensibilities naturally revolt at the thought of reducing by gas-retorts, the bodies of their loved ones to a minimum residue, a handful of ashes that can be so speedily scattered to the four winds by accident or design. Christian people will not change their mode of sepulture. Cremation is considered barbarous, and does in no way harmonize with our feelings and belief. Those in favor of it crave no better argument for conviction than permission to uncover every grave, and show people the human body after the process of decomposition has set in, but they are silent about the horrid scenes in and about the crematory.

So far we have had only to do with experiments and single tests, but suppose cremation should be adopted in New York and two hundred bodies burned to ashes daily, what guaranty could be given that what we carry home from one of the hundred or more crematory furnaces would be the ashes of our beloved? No, this busy work would indeed not satisfy, and the majority of the people would keep away from it as long as suitable grounds could be procured within easy reach.

Much has been said about desecration and violation of grave-yards, and the indecency of our present burial modes, in order to prove cremation to be the only system for practically disposing of the dead. But if in a sanitary view the promotion of decomposition of the human body in the grave should become a matter of necessity, a cheap chemical compound could be applied in the coffin which would reduce the body to dust in a comparatively short time after interment. But what alone can save us in the future from a disliked system which, in spite of our protest, tends to force its adoption upon us, is a reform in our burial system, consisting of a strict and systematic subdivision of each cemetery section into graves; allowing without exception but 30 square feet for each grave, and an equal space of 30 feet between to be reserved for the next descendants of the family or lot owner, thus avoiding the vast unnecessary area of burial-grounds. After an expiration of, say, one hundred years, should a lot prove to be abandoned, the unoccupied graves could then, if necessary, be given to new-comers.

One thousand acres of land, within easy reach of a large city, subdivided in this way and liberally provided with park-like planting and grouping in common, would form a permanent burial-ground for 600,000 to 700,000 inhabitants. All we need and all we reasonably can demand under existing circumstances, is a family resting-place on a handsomely planted and well preserved lawn with sufficient space for all its members to be buried thereon, and the assurance and guaranty given that our graves will be guarded and taken care of until all of those buried on the lot are reduced to dust and the interest for the graves has passed away. If, a hundred years after we are dead and gone, the generation then living think it well to rebury on the same lot, they will find no obstacles whatever on the lawn, as the reform proposes to abandon the erection of monuments of any description, except a horizontal slab for each grave. To distinguish more readily one family lot from the other, it is suggested to give these slabs a certain or peculiar form, different from those of the adjoining lot. J. Weidemann.

THE ILLUSTRATIONS.

PACKER MEMORIAL ALTAR AND REREDOS, MAUCH CHUNK, PA. MR. R. M. UPJOHN, ARCHITECT, NEW YORK, N. Y.

This structure was erected by the family of the late Hon. Asa Packer, who was one of the founders, for forty-four years a vestryman, and for twenty-four years one of the wardens of St. Mark's Church. The Memorial is built against the east end of the Chancel, extending nearly across its whole width and rising to a height of twenty-three feet from the floor. The Altar is of highly polished statuary marble, resting on steps of veined marble. The top is of one slab with inlaid maltese crosses of dark Sienna marble in the centre and corners, and surrounded with a rich heavy moulding. It is supported by four columns in front, the shafts of which are of dark Sienna marble, with bases and caps of statuary marble carved in natural foliage. On the front of the altar, between the columns, are three circular panels elaborately carved. The central panel contains a crown of thorns thrown over a Greek cross which is terminated with the symbols of the four Evangelists. The right hand panel contains the *Chi Rho*, and the left the *Alpha* and *Omega*, each in monogram and enriched with delicately carved grapes, wheat and leaf-work. On the face of the super-altar, in three sunken panels, is cut Sanctus. The Reredos is built of Caen stone, elaborately worked, in the middle pointed style of architecture. In general arrangement it is composed vertically of three bays, divided by heavy buttresses. The bays are again divided horizontally at the level of the super-altar by a line of inscription, below which, on the side bays, are three enriched panels containing deeply carved bunches of wheat, grapes, passion-flowers and lilies, and a part of the inscription in raised ribbon work. Above the line of inscription and forming the principal feature of the structure, are three groups of figures representing scenes from Holy Scripture. The figures are carved in high relief, about three-fourths life size. The central and most prominent group, rising above the altar, contains eleven figures in various attitudes, representing the scene on Mt. Olivet at the Ascension of our Lord — Acts 1:9.

On each side of this main group are post-resurrection scenes: on the right, the garden scene on the morning of the resurrection, representing the appearance of our Lord to Mary — John 20:15-17; and on the left, the appearance to the disciples on the evening of the resurrection — John 20:19-23 — in this group there are seven figures. In the main gable, above the Ascension scene, in a diapered niche, is a sitting figure of our Lord in majesty. His left hand holds a globe surmounted with a cross and His right hand is out-stretched in blessing. The base of the niche is supported by an angel corbel. Below the majesty, on two spandrels, are angels in adoration swinging censers; and above the figure, in the top spandrel of the gable, is a group of seraphim illustrative of the verse in the *Te Deum*, "To Thee cherubium and seraphim continually do cry." On the faces of the four buttresses are columns built up from the floor to the level of the super-altar, terminating with foliated capitals. On these, and under elaborately wrought and gabled canopies crocketed with animal heads, stand figures of the four Evangelists, each holding a book in the attitude of declamation. These figures are three feet and seven inches high. Between these buttresses, over the upper line of the inscription on each side of the main group, is a beautiful cornice richly carved in wheat, vine and fruit work, and capped with battlements. The buttresses are gabled at the top and terminate with crocketed pinnacles. These support four Angels playing upon musical instruments, representative of the Heavenly Host. The central gable is finished with a cornice of richly carved leaf-work, presenting one of the most pleasing features of the structcre. The whole is surmounted by a plain cross resting upon a foliated base. The inscription, carved in ancient gothic and medieval raised letters, is arranged in six sections in the two side bays, and reads as follows: —

To the Glory of God, And in Memory of Asa Packer, Born Decem. Xxix, Mdcccv, Died May Xvii, Mdccclxxix. This Reredos was erected by his Wife, Sarah M. Packer, And by his surviving children, Mary H., Robert A. and Harry E. Packer.

The main structure, including the carving and marble work, was executed by Messrs. Ellin & Kitson, of New York, and the sculpture by Mr. J. M. Moffit, of New York.

DESIGN FOR THE CHRISTIAN CHURCH, WASHINGTON, D. C. MESSRS. GRAY & PAGE, ARCHITECTS, WASHINGTON, D. C.

PLANS OF THE CHAMBER OF DEPUTIES IN THE PALACE MONTE CITORIO, ROME, ITALY.

For description, consult the succeeding article.

STAIRCASE OF CARDINAL DE LONGUEVILLE, IN THE CHATEAU CHATEAUDUM, FRANCE.

These plates, which are reproduced from the *Moniteur des Architectes*, show two stages of this staircase as restored by M. Doudier, architect.

THE HEATING, VENTILATING, AND LIGHTING OF THE CHAMBER OF DEPUTIES AT ROME.

THE provisional hall of Italian deputies is built of wood in the great palace of Monte Citorio. In plan the hall is in form a semicircle, 36.4 metres (118 feet) in diameter, which is connected with a rectangular extension. The circular part is divided into eight equal sectors, in which are arranged ten terraces, ranged upon which are the arm-chairs of the deputies, sixty-three to each sector; before each deputy is a desk and its accessories; the rectangular part is occupied by the President's desk, the benches of the ministers and commissioners, and the desks of the reporters; there is no tribune for speakers, members addressing the house from their desks. Around the hall are four galleries, each 4.06 metres (13 feet) wide, used for the following purposes: At the ground floor, the rectangular part affords two entrances to the hall; the circular portion (see plan and section), E_1, is provided with cloak-rooms and private letter-boxes; the circular portion of the second gallery, E_2, gives access to the hall at the level of the upper terrace; the third gallery E_3, which corresponds to the first story of the palace, forms a portion of the hall, — the tribunes; it is divided into thirty arcades, ceiled over at the height of 7 metres (22 feet 9 inches); these tribunes accommodate the spectators; the stalls in this gallery are also built *en gradin*. Finally, the fourth gallery, E_4, (see section), serves as a duct for the introduction of fresh air; its ceiling is on a level with the cornice of the hall. These galleries are separated from the palace by a passage-way intended to admit light; while they are connected with it by a number of covered bridges.

From the floor of the hall to the top of the cornice is 17½ metres (56 feet 10 inches). The cove of the hemi-spherical dome has a radius of 8½ metres (27 feet 7 inches); it is built of wood, except the upper part, 19 metres (61 feet 9 inches) in diameter, which is glazed; above this rises a lantern which, with the assistance of a large window in the gable of the hall at the right of the President, is intended to light the hall; the roof which covers the whole construction is of zinc.

This hall, of imposing appearance, is due to the commander Comotto, Inspector of Civil Engineering. The arrangements adopted for warming, ventilating, and especially lighting this temporary hall are particularly deserving of attention, because, being applicable to any hall of assemblage whatsoever, whether covered by a flat or a vaulted ceiling, whether large or small, they can be reproduced with the certainty of success. The study and the execution of the warming, ventilation, and lighting were entrusted by government to M Charles Reymond, engineer, a graduate of the École Centrale, whose many and very successful works ought to be better known in France.

The heating is effected by ten hot-air furnaces of cast-iron, A_1 to A_{10}, placed in the cellars of the palace, each with a heating surface of 60 square metres (70½ square yards); the fresh air is drawn partly from the passage-way mentioned above, and partly from the adjacent streets; the furnaces have a double enclosure of bricks, above which is a chamber for mixing the air, from whence lead large pipes which pass under the passage-way; the air is conducted by vertical shafts, C_1 to C_{18}, ranged uniformly around the outer walls of the gallery and communicating with the upper gallery, E_4, which forms, as has been said, a duct for the admission of fresh air. This fresh air is introduced directly into the hall by a great number of louvre windows, of sheet-iron, which are arranged in the spaces left between one modillion of the cornice and another, the slats of which form an angle of 25° with the horizontal.

The aspiration of the air is made without exception under each seat, where there are openings of the same forms as those of the orifices of introduction, and which are in communication with aspiration-ducts. The aspiration under the chairs of the deputies is effected by eight ducts, D_1 to D_8, placed under the terraces in the axis of each sector; these ducts are joined to those under the seats of the President and ministers, D_1 to D_6, and are gathered at last into a single collector, F, which leads to the foot of the tall ventilating shaft, B_1, there uniting with the collectors, G and I, which receive the aspiration-ducts C_1 to C_{18}. H unites the collectors F and G. The seats of the tribunes of the first story have their aspiration-ducts uniformly distributed over the whole circumference of the exterior walls of these galleries; they descend vertically, then underground are successively united so as to form at the foot of the ventilating-shaft only two collectors, one for the right-hand portion, one for the left-hand portion, of the tribunes.

All the air ducts are built with double brick walls; their surfaces are perfectly smooth and the angles well rounded; the hot-air ducts are supplied with iron registers, and the cold air and ventilation ducts have wooden registers covered with thin galvanized iron. During the winter the motor force is furnished to the great ventilating shaft by the smoke and gases of combustion of two neighboring furnaces, assisted by two great cast-iron heaters (*foyers*). The smoke of all is conducted to the top of the chimney by four pipes, whose lower part is of cast-iron and the rest of sheet-iron. The necessary movement of the air during the summer is produced by the two *foyers* alone, and in case of necessity fires are lighted on two large supplementary grates.

The total number of deputies is 510, but the number present at the meetings never reaches 400; the tribunes can hold 1,040 persons. The hall contains then a maximum of 1,440, for each of whom the engineer has provided 50 cubic metres (63½ cubic yards) of air per hour, that is a total of 72,000 cubic metres (91,440 cubic yards), an amount more than sufficient for good ventilation. The section of the duct for the introduction of fresh air is calculated for a velocity of 0.40 metres (15¾ inches) a second, and that of the aspiration-duct at 0.25 metres (9.7 inches). The total sectional area of the ducts for the introduction of air is, for the winter, 24.48 square metres (28.7 square yards), or double this for the summer, effected by the addition of supplementary ducts. The total section of the first aspiration ducts is the same for summer as winter, 28.57 square metres (33.5 square yards). The velocity of the air is 0.70 metres (27 inches) per second, and increases gradually in the collectors until it reaches 1.40 metres (4 feet 6 inches) at the entrance of the great chimney-shaft, whose height exclusive of the cap is 48.53 metres (157 feet 8 inches), its section at the base 12.54 square metres (14.7 square yards), and at the summit 9.50 square metres (10.8 square yards); it contains, as has been said, four smoke-pipes whose exterior diameters is 0.40 metres.

The temperature of the hall is in winter 20° centigrade (68° Fah.), and that of the rooms in connection with it 22° (71° Fah.). Before the meetings the hall is warmed directly from below by two large registers, K_1 K_2, each of which has a section of 1.25 square metres, which are closed as soon as it is desirable that the ventilating apparatus should come into play.

A large anemometer placed in the ventilating shaft, B_1, and connecting with an electric tell-tale in the office of M. Arnaud, the architect of the hall, permits perfect control of the apparatus.

The proper hygrometric condition of the atmosphere is maintained by evaporating pans of water, the surfaces of which can be varied at will. During the summer the hall is cooled by flowing over the whole surface of the roof water which has a temperature of 10° centigrade (50° Fah.); as for the air for ventilation, during extreme heat recourse is had to ice, which is placed at the mouths of the inlet ducts. By these means they have been able to maintain in the hall a temperature of 26° centigrade (79° Fah.), when the temperature outside was 30° centigrade (86° Fah.). Beside the hall, by means of distinct apparatus, M. Reymond has also heated and ventilated the numberless rooms of the whole palace of Monte Citorio. The ventilation for these rooms is effected by chimneys, B_2 to B_5, which in winter are heated by the smoke-pipes of neighboring furnaces, and in summer by *foyers*. In order to make the working of the apparatus for heating, ventilation, and refreshing the atmosphere, absolutely irreproachable, it would be necessary to give it in charge of a special official, intelligent and devoted, who would have an extremely delicate task to discharge satisfactorily, since it is necessary to attempt to satisfy everybody, or at least to give the utmost possible satisfaction to the most diverse temperaments.

The commission empowered to transfer the capital to Rome, together with the director of the works, besought the engineer, M. Reymond, to discover means of lighting the hall of assembly from above, making use only of the blank spaces between the modillions of the cornice which surrounds the hall, that is to say, by 136 rectangular spaces, 0.36 metres in length by 0.54 metres in depth, (14 inches by 21) and by 12 angular spaces.

According to the calculations made, taking into consideration all the circumstances, an illuminating power represented by 341 candles, or $48\frac{7}{10}$ Carcel lamps was needed for each penetration, — now, at this time (1871), the powerful *becs-phares* were unknown, and as it was not possible to place in an area of 0.19 metres square (about 2 square feet) a sufficient number of ordinary gas-jets, M. Reymond had recourse to enriched gas, which he obtained by carburetting the ordinary city gas with benzine.

This much premised, I will give a description of the different lighting apparatus, remarking that all the products of combustion are discharged outside the rooms and assist their ventilation. This important arrangement will in future be adopted in every hall of audience large or small.

Each penetration between two modillions recives a tin box whose bottom is formed by a wire grating, upon which is laid ground glass whose office it is to diminish the in ensity of the light. The walls of the tin case are pierced by a series of little holes at the level of the upper surface of the glass. Through these is admitted the air necessary for the combustion of the gas. Above the tin case are placed two centres of illumination each composed of a copper circlet bearing four bats-wings burners and in the centre a little below them another burner of equivalent power, attached to which is a smaller burner (*veilleuse*) which, never extinguished, furnishes instantaneous light to the other burners in the group. Each penetration is covered by a large parabolic reflector of plated silver, which is pierced by holes over each centre of illumination to allow of the passage of the gases of combustion into the ventilating tubes which connect with the top of the reflector and discharge into some of the vertical ventilating shafts which serve the apparatus for lighting the tribunes. The portions of this apparatus which, extending above the cornice, would be seen from below, are concealed by an open-work balustrade which crowns this member.

The illumination of the tribunes is effected through the floor of the fourth gallery by means of a circular opening, 42 metres (14 inches) in diameter, constructed at the centre of each of the thirty vaults which cover the tribunes. The arrangement for lighting is the same as that employed in the main cornice, save that the case is cylindrical and only one centre of illumination is needed for each vault, while the reflector is placed over it like a cap, through the centre of which passes the tube for the escape of the gases of combustion. Each of these ventilating tubes, which are movable so as to allow of the cleansing of the reflector, rises vertically and passes through the roof receiving on its way the ventilating tubes of five of the cornice lights. There are then for the hall and tribunes together but thirty of these ventilating tubes, in each one of which circulation is started by a special gas-jet which is lighted at the time the hall itself is lighted.

As it was important in this case to lower as much as possible the temperature of the products of gas combustion, the diameters of all these ventilating tubes were calculated to allow for the passage of 150 cubic metres of air for each cubic metre of gas consumed: besides, all the tubes of sheet-iron are covered with a composition of plaster, clay and hair, and as a protection against fire where they pass through wood-work are surrounded by a sleeve which ensures a free air-space about them.

The galleries of the ground floor and *entresol* are lighted by sixty gas brackets of bronze with ground glass shades, each containing forty gas-jets. These brackets are attached to the wall by two arms, the lowermost one concealing the supply-pipe, while the other one contains the ventilating tube. Each lamp contains a small ever-lighted jet. At first these lamps were furnished with a copper circlet pierced by 150 holes, but because of the difficulty of keeping the holes clean the system was abandoned.

In the cellar of the palace on the side of the Place Monte Citorio are the gasometres and carburetters and other apparatus of the service.

In the cornice there are 136 penetrations, each furnished with ten jets; at each of twelve angles there are also five jets, while each of the thirty vaults over the tribunes is furnished with five jets, so that there is a total of 1570 jets for which the theoretical expenditure of gas would be 188,400 litres per hour, but as a matter of fact, owing to the use of carburetted gas, only 178,523 litres per hour are used.

The following legend will enable any one by referring to the plans to follow these arrangements in detail.

[*These arrangements are symmetrical.*]

a. The main gas meter.
b. Pipe supplying ordinary city gas to the gas meter.
c. Exit of gas from meter. In case the meter is out of order, gas can pass directly from *b* to *c*.
d_1 to d^6. Three carburetters which serve the Hall of the Uncondemned and the galleries, *e* to *e*.
d. Point of supply for these carburetters.
d_2 to d_8. Pipes supplying enriched gas to the above mentioned parts of the building.
e. Point of supply for the hall and the tribunes.
e to e_2. Four large carburetters for the hall and tribunes.
e_1 to e_6. Pipes running parallel to *d*, supplying enriched gas to the hall and tribunes.
e_6. Vertical supply-pipes placed in the aspiration ducts to $e1$ to e^{18}.
e_6 to e_9. Pipe supplying enriched gas laid in the duct e^4 which encircles the hall.
b_1. Pressure regulator for *e*.
b_2. Pressure regulator for *d*.
f. Iron pipe supplying ordinary city gas to the small *veilleuses* of the lamps in the galleries and Hall of the Uncondemned.
g. Pipe doing the same duty for the cornice lights of the main hall.
i_1 i_2. Collector of waste products from the lights in the main cornice and the tribunes.

In conclusion, I must say that the light is superb in its brilliancy and steadiness, and the general effect is the more grand since the vault of the main hall not being lighted its height appears the greater.

Emile Muller, in Le Génie Civil.

DAMP.

UNDER this title M. G. Philippe, a civil engineer officially employed by the municipality of Rouen, has contributed to *Les Travaux Publics* a series of valuable and interesting papers, of which the *Builder* reproduces the principal points.

The *causes* of damp in buildings are: 1, the presence of water in the atmosphere and the soil; 2, the porosity of building materials, which absorb it.

Its *effects* are only too well known, and may be classed as: 1, disintegration of masonry, with injury to wall-papers and other similarly-placed decorations; 2, decay of timber, and injury to wooden furniture; 3, development of saltpetre on walls, with injury to wall-decorations; 4, injury to health of inhabitants.

The decay of the timber used in building often carries with it an especial danger in France, because there chestnut-wood is frequently employed for large beams; and as this wood decays first at the heart, while the outside remains sound, no superficial examination will give warning when an important piece of timber may be about to give way.

The development of saltpetre results from drying after damp. It is well known that this substance can be obtained from old building materials, and the white patches which it forms upon perfectly sound walls are familiar. During the siege of Paris, in 1870, the possibility of utilizing it for military purposes was taken into consideration, and a committee was appointed to investigate the amount obtainable in this way in case of necessity. It reported that the production of saltpetre in a building was in direct proportion to its age and uncleanliness. This conclusion appears very obvious, when we remember that saltpetre consists of potash, combined with nitric acid, and that nitric acid is azotate of ammonia. Kuhlmann, a distinguished chemist, proved by experiment that ammonia contained in a porous body is oxidized by contact with the air, and becomes azotate of ammonia. Fermenting vegetable and animal matter everywhere furnishes ammonia, building materials are the porous body required, and all clays contain potash; so that all the component parts of saltpetre are ready to hand, and as soon as the moisture which has held it in solution is evaporated by dryer air, the salt appears upon the surface. It is not necessary that ammonia should be present in any offensive form; rain will contain it, and fogs (especially town fogs) carry it in comparatively large quantities.

The prevention and cure of damp may be attempted by: (1) employment of suitable materials for cellars and other parts of buildings below or on the level of the soil; (2) damp-courses to stop the upward progress of damp; (3) preparations of different natures, either to protect the face of an exposed wall from the weather, or to prevent damp in the wall from affecting an apartment; (4) precautions against infiltration.

The most thoroughly sanitary foundation for a building is concrete; and the author recommends covering the whole level of the future building with a layer four inches thick, composed of two-thirds broken flints well washed, and one-third mortar made of lime and gravel sand. He estimates that such a layer would cost about two and a half pence per square foot.

Well-puddled clay forms a good and inexpensive foundation in districts where it is easily obtained. A layer eight inches thick should be spread over the site of the building, and extend for about sixteen inches outside the walls; and the external sixteen inches should be carried up with the wall until the level of the soil is reached. Clay cannot, however, be used to form a dry flooring for old buildings, as can be done with concrete.

Various methods have been proposed and employed for destroying that porosity of building materials which is one of the chief causes of the mischief. M. Sébille, a civil engineer in Paris, has patented a process for injecting materials (especially brick) with gas refuse, which penetrates their substance, and renders them impermeable by water, at the same time increasing their weight and giving them a brown color. A wall built with bricks thus prepared is absolutely dry, and their price is only increased by about 3*s*. 4*d*. per 1,000. Good results have been obtained by immersing the materials in solutions of soap and alum successively, and by applying these two preparations to the thoroughly scraped surfaces of the walls of buildings already standing. The result of the chemical reaction which follows is to fill the pores of the brick or stone with a fatty substance, which opposes the passage of water. The immersion costs about 1*d*. per cubic foot of material.

The method preferred by M. Philippe is to plunge the material with the hand into a solution of silicate of potash for a time, merely long enough to allow all the air-bubbles to disengage themselves from its surface, and then to lay it aside for forty-eight hours before using. The additional expense is extremely small, and the results (according to his experience) very satisfactory.

Many varieties of cement and other material are employed for mixing with mortar, in order to render it impermeable by water; of these the principal are Vassy or Gariel cement, Vicat (from Grenoble), Portland, French Portland, and Peterspense cements, ground brick, puzzolana (volcanic), wood-ashes, calcined oyster-shells, etc. The greatest additional expense from using any of these is from 3*d*. to 7*d*. per cubic foot of masonry. A layer of such cement one inch thick, lining the walls of cellars, etc., is very useful, and costs on an average a little over 3*d*. per square foot. M. Philippe does not recommend French Portland cement, which is prepared chiefly at Boulogne, and which is much used in the North of France, as it very imperfectly excludes damp, and is easily penetrated by saltpetre. Of French cements he prefers the most expensive — that of Vassy. For application to damp walls, solutions of soap and alum, used one after the other, have already been mentioned. Another substance which has proved useful for the purpose is gas-tar. The wall must be well scraped, heated in parts by means of a hand-stove, and the tar applied with a brush as hot as possible. It then penetrates into the pores, and hardens in cooling, forming a crust which arrests the passage of damp and saltpetre. The cost is very trifling.

An important and interesting piece of work of this kind was performed about the year 1813, under the direction of MM. Darcet and Thénard; and as their methods have not been surpassed, we quote a portion of their own account, extracted by M. Philippe from Vol. 32 of the "Annales de Chimie et de Physique:" —

In that year "M. Gros undertook to paint the upper cupola of the Church of Sainte Geneviève. The surface had been prepared like a canvas, with a layer of strong size, covered with white-lead mixed in drying oil. M. Gros consulted us upon the durability of this composition, and we did not hesitate to declare that it was far from offering the desired security against damp. After consideration and experiment, we adopted the following method. All the previously-applied preparation was entirely removed; portions of the interior of the cupola were then successively and highly heated by means of a large gilder's stove, and our preparation applied with large pincers, at a temperature of about 212° Fahr. To facilitate its absorption, the wall was reheated once or twice during the process. Successive coatings were applied until no more could be absorbed. When dry, a coating of white-lead mixed in oil was superposed, upon which the painting was to be executed. The preparation used consisted of one part of wax and three parts of boiled oil, with one-tenth its weight of litharge. The heat employed must merely stop short of carbonizing the oil."

The same process was applied by its inventors to two damp underground rooms at the Sorbonne. The mixture was slightly different, consisting of one part oil prepared with litharge, and two parts resin melted in the oil, — an operation of some delicacy. The plaster was allowed to remain on the walls, and they were thoroughly dried with a gilder's furnace, which, by an ingenious arrangement, was made to move along the wall at a fixed distance from it, and at any height. When dry, they were again heated for the application of the varnish, as in the preceding case. Five coatings were absorbed; the sixth was partially absorbed, and formed a smooth hard surface to the wall. The cost of the process is chiefly that of the labor; the value of the materials being about 1*d*. per square yard.

M. Philippe proceeds to make suggestions and give opinions on various points of detail, some of which we reproduce.

Parquets may be preserved by laying them upon bitumen. This invention was patented by M. Gourguechon, but his patent has expired. It has been successfully varied by laying down a well-smoothed bed of cement, then applying a thin layer of asphalt to a portion at a time, and laying down the parquet before the asphalt had cooled. The only difficulty with these methods is that they cannot be used with pieces of parquet much exceeding one yard in length. The frames by which the parquet is held should be fastened to rows of spaced bricks, and the intervals filled up with pebbles, cinders, or other dry and healthy material, avoiding saw-dust, old plaster, and similar matters.

Ventilating bricks on the Flagedé system may be made on the spot in a mill supplied by the inventor, at the rate of from three hundred to four hundred per day, of almost any materials that may be at hand, — plaster, conglomerate, brick-earth, even of *torchis* (clay mixed with straw and grass). They admit air to the interior of the walls, and thus keep them dry. Their size is double that of bricks, and their price comes to about £1 per 1,000.

The *Journet patent* for dry floors or areas consists in laying down a bed of cement about two inches thick, in which small pipes are laid at about one inch apart, and then covered with another two-inch layer. When the cement begins to harden, the pipes are drawn out by the end, leaving hollow tubes, through which the air can circulate, if proper openings are provided in the walls.

Silicate applied to the surface of buildings renders them almost impervious to the action of weather. It has been applied by M. Kuhlmann to the principal monuments in the town of Lille, and to the new buildings of the Louvre in Paris, with the additional good result of harmonizing their tone with that of the older portions. It costs about 10*d*. per square yard for three successive applications at twenty-four hours' interval. M. Mignot has invented a cheaper preparation, colored to suit the different kinds of stone. It is to be noted that silicates cannot be used upon walls where saltpetre has been or is likely to be developed.

Enduits have been invented in great variety by different makers. A very excellent one, called Glyko-metallic liquid, is prepared by MM. Caron et Dupuis. It prevents all action of damp on cement and plaster, by neutralizing the alkaline salts which they contain, and can be painted on with perfect security. Old walls should be well cleaned before it is applied; new ones will require three coats, which will cost about 9*d*. per square yard. An excellent preparation of gutta-percha is supplied by the Maison Gaudri, in Paris, for the same purpose, and costs about the same price.

Windows are one of the principal avenues of damp into apartments. One cause of this is the bad quality of the stone often employed. It should be as hard as can be obtained; or it might be covered with zinc, or coated with a good cement. Small leaden gutters may be placed inside the windows, to catch and carry off the rain which penetrates. This plan is particularly recommended for the windows of kitchens and bath-rooms, where the steam condenses on the glass in considerable quantity.

For *slates*, M. Philippe recommends either the Fourgeau or Chevreau system of hooks in preference to the ordinary method of nailing, which makes a hole through which damp penetrates.

Drains from closets should be furnished with a ventilating-pipe, carried up with the chimneys, or which may (as at the Hôpital St. Louis and the old Hôtel-Dieu at Paris) open direct into the kitchen flue, thus being always secure of a strong upward draught. In this way all unpleasant smells are obviated.

MAHOGANY.

There is perhaps no wood with which we are acquainted of which so many varieties are known as that we term mahogany or baywood. The mahogany first introduced and used mainly for cabinet-work was the dark, dense timber termed "Spanish mahogany," imported chiefly from San Domingo. From this source for many years all the best logs were obtained, and the fine old furniture of the Georgian period was almost all of it made of the San Domingo wood. As soon as this supply fell short, other islands in the Antilles and the mainland of the isthmus were explored, and quantities of excellent wood were obtained from them. The wood from the central region of Mexico and from the island of Cuba was but little inferior to the best qualities from St. Domingo; and from the regions farther south, in Honduras, British and Dutch Guiana, logs of more fully-grown timber and of vast size were obtained. The lighter, open-grained wood, termed "baywood" or "Honduras," which in its best form may even approach the quality of the Spanish mahogany, but which chiefly approximates more nearly the texture of cedar, is now much used for joiners' work. The finest old Spanish wood is so scarce and valuable that the bulk of it is probably cut up for veneers. The Cuba wood, which takes the place of that formerly brought from San Domingo, is mostly small. It comes over in sticks rather than in logs, seldom exceeding two feet square, and is liable to be "stainy" or streaked with purple. Some of the Central American timber from the interior of Mexico is very dense and rich in color, and perhaps rivals that from Cuba. All mahogany darkens in color on exposure to the atmosphere; but it is a favorite trick to stain the lighter varieties with an alkaline wash, in order to give them a darker tone. Few woods stand wear and tear better in cabinet-work than fine mahogany, and the bright, rich tints are found in no other wood with which we are familiar. It seems probable that all the mahogany timber to which we have alluded is the produce of the same tree, the *Swietenia mahogani* of botanists, so called after Van Swieten, a Dutch physician; but evidence on this point is rather confusing. The value of mahogany fluctuates greatly, and the purchase of this timber is said to be always somewhat of a lottery. Buyers test the quality by boring into the log with an auger; but this plan is liable to mislead. There is a sort of tradition, the truth of which it is difficult to test, that Messrs. Broadwood once gave £3,000 for three logs of mahogany, all of them cut from one tree. Each balk was 15 feet in length, and 3 feet 2 inches square. This would give 451 cubic feet, and a price of £6 13*s*. per cubic foot. In some other accounts of this transaction, the price named is £2,000, which, if correct, would represent £5 9*s*. per cubic foot. The cause of this extraordinary price is said to have been the extreme beauty of the "curl" or figure of the wood, which rendered it suitable for the production of veneers. Strange to say, this high-priced mahogany was imported from Honduras, and it seems probable that while the northern district of the country bordering on Mexico produces dense and fine qualities of timber, the wood grown in the low, swampy districts to the southward has given a bad name to the mahogany of the whole district. In an interesting paper read at the Society of Arts by Mr. Leonard Wray in 1859, on "Timber for Ship-Building," printed in Vol. VII. of the Society's "Transactions," an account is given of the cutting down and preparation of this wood for sale, and, as touching the density of the best Northern Honduras mahogany, we read that its specific gravity equals that of the finest Travancore teak, and is superior to English oak. The difficulties in felling the wood in the trackless forests and bringing it to Belize for sale appear to be immense, and all the labor has to be done at night by torchlight, owing to the intense heat.

Mr. Wray, in the paper before alluded to, states that mahogany is only classed in the second rate at Lloyds's among the timbers for ship-building purposes. While eight varieties of wood are ranked in the first division, we find mahogany included among the twenty species of timber placed in the second class, the reason being that fine, dense mahogany is too costly and good for the purpose, while the cheaper baywood, the price of which would enable it to be used, comes only in the second division. The mahogany of Hispaniola is said to have been used by Raleigh for the repair of one of his ships in 1595, and a Spanish line-of-battle ship, built at Havana, of the finest picked timber, when captured by the English and broken up, more than a hundred years after she had been launched, was found to have every timber sound. The Queen's own steam-yacht, the *Victoria and Albert*, is built of mahogany.

Concerning the first use of the wood in this country, it is stated that Dr. Gibbons, of King Street, Covent Garden, having received a few planks from his brother, a sea-captain, in 1724, had some of the wood, which had been previously rejected by a builder as worthless, and incapable of being worked, made into a candle-box by a cabinet-maker named Wollaston, who recognized the fine qualities of the material, for which a demand speedily sprang up, and from which he is said to have realized a fortune. The mahogany of East India and the west coast of Africa, though the produce of trees of the same natural order, the *Cedrelaceæ*, does not appear to be obtained from the Swietenia, and the wood is in many ways inferior to the West Indian timber. In the above notes we have brought together as far as possible the existing information respecting mahogany; and in drawing attention to the subject, we trust we may elicit some additional facts from those among our readers who have had practical experience concerning this timber. — *The Building News.*

ARCHITECT'S CHARGES.

PARAIRE *v.* THE ALCAZAR COMPANY.

THE following is a copy of the Referee's award in this case, particulars of which were given in our last: — "In the High Court of Justice, Queen's Bench Division, between E. Lewis Paraire, plaintiff, and The Alcazar Company (Limited), defendents — Whereas by an order of Master Gordon made in this action, and dated 13th June, 1881, it was ordered that the following question arising in this action, namely, the matters of account herein, be referred for inquiry-report to me, Jno. Whichcord, or to such person as agreed upon by the parties, or in case of difference to be named by the Master. And whereas, by another order made in this action by Master Dodgson, dated 5th July, 1881, and made by consent of the parties, and upon reading the said order of 13th June, 1881, and upon the defendant company admitting their liability to the plaintiff except as to the amount due to him, and withdrawing the first paragraph of their statement of defence in the said action, it was ordered that the matters of account in this action directed to be referred for inquiry and report by the said order be referred for inquiry and report to me, the said John Whichcord, of Palace-chambers, Westminster, late President of the Royal Institute of British Architects, under Section 56 of the Judicature Act, 1873. Now, I, the said John Whichcord, having taken upon myself the burthen of the said reference, and having heard the said parties by their counsel and their witnesses, and evidence produced before me, do hereby report to the Court as follows: that is to say, that I have considered the matters of account in question in this action, and I find that the total amount due to the plaintiff in respect of the matters aforesaid was at the commencement of this action 1,043*l.* and no more. As witness my hand this 12th August, 1881.

(Signed) JOHN WHICHCORD, Referee.

Witness, — E. Edward Habutt, Merchant, 31, Lombard Street.

NOTES AND CLIPPINGS.

THE VALUE OF IMMIGRATION. — The *American Ship* rightly says that the average human being has a working value which may be expressed in dollars. His potential worth in money has been of late the subject of new calculations in Europe. What to the Old World is the loss *per capita* resulting from the mighty Western movement now going on? The London *Economist* examines this problem again, and declares that a fair valuation of the average emigrant, in capital, or capital-creating force, is not less than $1,000. This estimate agrees with that of other authorities in political economy. It may be accepted as approximately correct. If Europe loses the equivalent of $1,000 in the emigrant who leaves any of her ports, America gains $1,000 by his arrival here. Looking at emigrants in this strictly business-like way, we begin to realize the enormous accession of wealth pouring into this country from emigrant ships. A single day's work at Castle Garden enriches the United States by the sum of from $4,000,000 to $4,500,000. The daily average of arrivals, even at this favorable season for emigration, is lower than either of these estimates. But it is not too much to expect that the influx for the present year at all the ports of the United States will not fall short of 700,000. From this source, then, the country will have gained, in round numbers, $700,000,000. There could be no greater folly than to arrest or to obstruct this incoming wealth by enforcing a New York head tax on each representative of the $1,000. We trust that Congress will finally come to the relief of our local courts in solving this question. — *Northwestern Lumberman.*

LONDON WATER. — Professor E. Frankland, in his report on the work in the Chemical Department of the Science Schools at South Kensington, refers to the numerous samples of water sent from the Local Government Board which have been analyzed and reported upon by him, and to his monthly analyses of the various potable waters supplied to the inner and portions of the outer circle of the metropolis. These last-named analyses show that the inner circle of London was supplied with an average daily volume of 142,190,922 gallons of water, of which 71,879,776 gallons were sometimes grossly polluted by sewage matters; 61,765,034 gallons were occasionally so polluted, but to a less degree; whilst only 8,546,112 gallons were uniformly of excellent quality for drinking. The average daily volume supplied per head of population was 34.1 gallons. This is greatly in excess of what is required, and indicates gross waste; but whilst the quantity was abundant, the quality of the river-water was generally indifferent and often very objectionable.

RESTORATION. — The Bishop of Carlisle, in re-opening the small but ancient church of Over Denton, near Gilsland, referred to the expediency of restorations. He knew, he said, it was quite possible to find fault with restoration. An antiquarian will go into a church and he will say you have put a wrong window in one place, or you have closed a window where you had no business to close it in another, or you have built a wall which you ought to have left alone, or buttressed up so that it could not have tumbled down. He knew how easy it was to make such criticisms, and he did not deny that sometimes they were just; but he maintained that the first and great purpose of a church is not that it should be made interesting to the antiquarian, but that it should be comely as a place for God's worship, and useful for the people who have to worship in it. In utterances like his lordship's it is easy to recognize the fact that there is a reaction in public, or rather clerical, opinion, with regard to restoration. A little while ago the influence of the Society for the Preservation of Ancient Buildings was paramount, and no clergyman had the courage to defend his own action in promoting the restoration of a church. But when two dignitaries like the Bishop of Carlisle and the Dean of Worcester are found in one week to support the principle of restoration, it may be expected that they will find many imitators. — *The Architect.*

DREDGING THE POTOMAC. — Mr. Ely, contractor for making the tramway for conveying the mud and débris to be dredged from the Washington channel of the Potomac, is making progress, having already driven about three hundred piles south of the Long Bridge, and nearly on a line with it. These piles are of black pine from the forests of Maryland and Virginia, and are driven at convenient distances for laying cross-ties and sleepers for the rails. The piles are left standing pretty high in order to make the tramway as elevated as possible. They can be pulled up when necessary to change the course of the tramway, and driven again, thus making them do double service. The Washington *Star* says: "The growth of wild oats on the river-bottoms this season is unusually luxuriant, almost hiding the piles already driven from view, and the stench arising from these flats, when the tide is low, is almost intolerable. The cause of this rank growth is thought to be the vast quantity of débris deposited over the flats last winter during the ice gorge."

PENNSYLVANIA MAPLE FORESTS. — A Harrisburg paper calls attention to the maple and hemlock forests of Pennsylvania, and remarks that there has never been the right kind of enterprise to render those woods as important and useful as they merit. It is claimed that the maple wealth of the Keystone State is as great as that of black walnut once was, if properly handled, because the wood is hard and can be utilized to produce a beautiful effect in building and furniture. There is an enormous supply of maple in Pennsylvania, and it is predicted that sooner or later it will become one of the most profitable sources of industry in the State. — *Northwestern Lumberman.*

THE ELECTRIC LIGHT AND VEGETATION. — Dr. C. W. Siemens, of London, claims to have discovered that vegetation flourishes under electric light as under solar, producing chlorophyle, and bringing flowers and fruit into bloom and ripeness. He experimented all last winter with a six-horse-power engine connected with his lamps of about four thousand candle-power each. One of these was placed inside a glass house of 2,318 cubic feet capacity, and the other was suspended at a height of twelve or fourteen feet above some sunk greenhouses. The experiments lasted from October to May last. The first trials were not very satisfactory, and the fact being attributed to the excessive glare of the lamps, equivalents of clouds were made by jets of steam, and the rays were further intercepted by thin sheets of glass, some white and others colored, the effects varying with the tint of the medium. The most vigorous growth was where the glass was white, next the yellow, and after that the red and blue, which produced only lanky growths. The cost of the process is only twelve cents a night for a light of five thousand candles, and the Doctor is so well satisfied that he hopes to stimulate the day growth of vegetables by adding electric forces to those of the sun. — *N. Y. Times.*

ADOBE BRICKS. — At Las Vegas for the first time we saw the adobe bricks in process of manufacture — a process simple enough. With a hoe a man mixes mud, water, and cut wheat-straw in the proper proportions to secure consistency, and then moulds it in a box eighteen inches long by ten in width. The bricks are then spread in the sun to dry, and it is not unusual to see grass sprouting from them if the weather has been damp. From these the much gazed-at adobe house is made, a structure capable (in the climate in which it is used) of enduring for three hundred years. The roofs of the ordinary adobes are almost flat, and made of mud and spread on about six inches thick. There is a peculiarity about these roofs. When it rains, they seldom leak until a week after, for by that time the water has an opportunity of soaking through. This is convenient for the inmates, as the weather being then clear they can move out. — *Columbus Morse.*

BUILDING INTELLIGENCE.

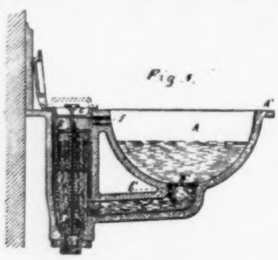
(Reported for The American Architect and Building News.)

[*Although a large portion of the building intelligence is provided by their regular correspondents, the editors greatly desire to receive voluntary information, especially from the smaller and outlying towns.*]

BUILDING PATENTS.

[*Printed specifications of any patents here mentioned, together with full detail illustrations, may be obtained of the Commissioner of Patents, at Washington, for twenty-five cents.*]

243,718. WASH-BASIN. — Charles H. Moore, Yonkers, N. Y. This invention consists of a wash-basin, a slab, and an outlet-chamber, made in one piece, with a float operating in the outlet-chamber, and a soap-dish fitted in the surface-opening of said chamber. It also consists of a plug-valve fitted in an independent valve-seat secured in the bottom of the outlet-chamber. A′ shows the slab, A the bowl, and B an enlarged chamber, adapted to contain a soap-dish, in the surface-opening, and extending downward to the outlet. This chamber has a float operating in it, and is



shaped at the lower end to receive an independent seat for the plug-valve to operate in. This valve-seat *b* has a shank on it, and is secured to the end of chamber B with a lock-nut. The float H, operating in the chamber B, is intended to lift the valve *e* in case of any accidental increase of water in the basin; and the channel *f*, which is most applicable to bath-tubs, is intended as an auxiliary to supply the outlet or float-chamber B. B′ is a counter-sunk outlet of the basin A, into which a movable strainer, E, is fitted to afford access to the passage C. G represents a soap-dish fitted in the open chamber B, having a passage through it for the spindle of the plug-valve to operate in.

246,593. STEAM ROCK-DRILL. — Samuel G. Bryer, Saugus, Mass.

246,597. SHEET-METAL AND CONCRETE PIPE FOR DRAINS, &C.—Mortimer M. Camp, New Haven, Conn.

246,605. LOCK.—Frederick Egge, Bridgeport, Conn.

246,609. WINDMILL.—Francis J. Goldsmith, Painesville, O.

246,615. BOLT. — William T. Kenyon, New Britain, Conn.

246,618. FAUCET.—Thomas F. Langley, East Kingston, N. H.

246,626. WARMING AND VENTILATING APARTMENTS BY THE SUN'S RAYS. — Edward S. Morse, Salem, Mass.

246,631. KNOB FOR LATCH-LOCKS. — Henry M. Paine, Newark, N. J.

246,639. TRANSOM-LIFTER. — Henry E. Russell, Jr., New Britain, Conn.

246,642. DOOR-HANGER. — Samuel Selden, Erie, Pa.

246,655. MARINE STRUCTURE FOR WATER-WORKS. — Geo. R. Bramhall, Chicago, Ill.

246,656. WEATHER-STRIP. — James C. Brannon, Independence, Kan.

246,658. FIRE-ESCAPE. — Robert Bustin, St. John, New Brunswick, Canada.

246,659. CURTAIN-CORD TIGHTENER. — Samuel G. B. Cook, Baltimore, Md.

246,663. PANTOGRAPH. — James B. Crocker, Jr., and Bernard Frese, Chicago, Ill.

246,684. SELF-CLOSING VALVE AND FAUCET.—Geo. R. Moore, Philadelphia, Pa.

246,703. DETACHABLE SAW-TOOTH. — Elias C. Atkins, Indianapolis, Ind.

246,704. SASH-HOLDER. — Albert Ayers, Rahway, N. J

246,708. SPRING-HINGE. — Joseph H. Banker, Cincinnati, O.

246,709. STOVE-PIPE DAMPER. — Ashbell Barnum, Green Island, N. Y.

246,719. PLUMBER'S TRAP. — Andrew Campbell, Brooklyn, N. Y.

246,736. MACHINE FOR FORMING METALLIC EAVES-TROUGHS. — James Dunn, Port Hope, Ontario, Canada.

246,741. HOISTING-APPARATUS. — Albert C. Foster, Lake, Ill.

246,746. SCREW-DRIVER. — George E. Gay and John H. Parsons, Augusta, Me.

246,752. HASP-LOCK. — Hanson Goodrich and Joseph R. Siddall, McLeansborough, Ill.

246,757. CHIMNEY-FLUE BRUSH. — David C. Greenway, Abingdon, Va.

246,762. PRESERVING WOOD. — Erwin Hagen, St. Louis, Mo.

246,781. AIR-COOLING APPARATUS. — Ralph S. Jennings, Baltimore, Md.

246,783. MOULD FOR FORMING THE WALLS OF CISTERNS OR WELLS. — Olof Johnson and Johan J. Sandstrom, Algona, Ia.

246,790. HEATING-APPARATUS FOR BUILDINGS. — Ernst Korting, Brunswick, Germany.

246,801. PUMP AND WATER-ELEVATOR. — Charles L. Merrill, Indianapolis, Ind.

AN EXHIBITION

— OF —

Architectural Drawings

— WILL BE HELD —

IN CONNECTION WITH THE FAIR

— OF THE —

Massachusetts Charitable Mechanic Association,

IN BOSTON,

During September and October, 1881.

ARCHITECTS IN EVERY PART OF THE COUNTRY

Are invited to contribute Designs to this Exhibition, and to forward their Contributions as soon as possible.

Drawings may be sent by mail, by express, prepaid, or by freight at reduced rates arranged by the officers of the association, to T. M. CLARK, 178 Devonshire Street; HENRY A. TURNER, 31 West Street; JOHN S. DAMRELL, City-Hall, or to the *American Architect*, 211 Tremont Street, Boston, Mass.

BUILDING INTELLIGENCE.

246,814. LOCK-HINGE. — Charles W. Pierce, Oak Hill, N. Y.

246,815. VENTILATING-MACHINE. — William A. Pitt, New York, N. Y.

246,840. WOOD-BORING MACHINE.—James M. Trackwell, Skookumchuck, Wash.

246,841. WINDOW, SKYLIGHT, &C. — William Trotter, Jr., Oyster Bay, N. Y.

246,845. APPARATUS FOR ILLUMINATING BUILDINGS. — Jonadab B. Whitcomb, Berkeley, Cal.

246,846. EXPANDING MANDREL. — John A. Wilde, Hudson, N. Y.

246,853. VENEERING WOOD. — George Woods, Cambridgeport, Mass.

9,860. (*Reissue.*) COMBINED CLUTCH AND BRAKE OF HOISTING-DRUMS FOR ELEVATORS, &C. — Julius S. Lane, Akron, O.

SUMMARY OF THE WEEK.

Baltimore.

BUILDING PERMITS. — Fifteen permits have been issued during the past week, the following being the most important: —

S. D. Price, 9 dwells., Ann St., north of Biddle St.

Henry Sprain, brick dwell., 25 Bethel St., bet. Pratt and Lombard Sts.

Henry Winder, three-st'y brick building, n w cor. Hudson and Henly Sts.

Lewis Seldner & Son, five-st'y warehouse, Liberty St., bet. German and Lombard Sts.

Joseph Turner, 8 three-st'y brick dwells., Townsend St., commencing at s e cor. John and Townsend Sts., and 7 three-st'y brick dwells., John St., commencing 100′ south of Townsend St., corner houses 20′ front, others 17′; cost, $3,500 each; E. G. Lind, architect.

Epworth Church. — Brick and stone church building, cor. Mosher and Gilmor Sts.

James Corner & Sons, brick and iron warehouse, Ann St., south of Thames St.

WAREHOUSES. — Two brick warehouses, 24′ x 85′ each, stone and terra-cotta finish, to be built for Mr. A. Brafman and Mr. Lewis Seldner respectively, are now in process of erection on Liberty St., near German; cost, $20,000 and $21,000; B. F. Bennett, contractor; Chas. L. Carson, architect.

ALTERATIONS. — The front and interior of "Temperance Temple," South Gay St., near Fayette, are being re-modelled under drawings prepared by Mr. Jackson C. Gott, architect. The improvements, which will cost about $6,000, are being executed by Mr. Henry C. Albaugh.

CLUB-HOUSE. — The competition for the "Merchants' Club," participated in by Messrs. J. A. & W. T. Wilson, Niernsie & Son, C. E. Cassell, and J. C. Neilson has resulted in the selection of the design submitted by Messrs. Niernsie & Son, a premium of $100 being awarded to each of the other competitors. The building is to be about 49′ x 81′, located on German St., near South, and will cost about $25,000.

Boston.

BUILDING PERMITS. — *Wood.* — *Webster St.*, near Cambridge St., for Ebenezer A. Hollis, 2 dwells., 20′ x 30′, L 18′ x 28′, two-st'y; Henry M. Perry, builder.

Warner Ave., near Harvard St., for Herbert E. Dennett, 2 dwells., 19′ x 30′, two-st'y; Joseph Stewart, builder,

Warner Ave., near Harvard St., for Herbert E. Dennett, dwell., 19′ x 33′, two-st'y; Joseph Stewart, builder.

BUILDING INTELLIGENCE.

Cedar Grove Cemetery, Adams St., near Milton St., for City of Boston, greenhouse, 23′ x 65′, 2 ells 11′ x 80′ 6″ each; John H. Burt & Co., builders.

Parker St., near Dorchester Ave., for A. W. Tice, dwell., 21′ x 30′, two-st'y; Charles Stinson & Co., builders.

Hoffman St., rear of, near Gilbert St., for Michael Mitchell, stable, 20′ x 32′; John L. Dakin, builder.

Hartford St., near Sargent St., for James D. McLellan, dwell., 22′ x 32′, two-st'y; Jas. D. McLellan, builder.

Bowdoin St., near Bellevue St., for Edward N. Capen, storage of carriages, 38′ x 50′, two-st'y; J. B. Keene, builder.

Crawford St., cor. Elm Ave., for G. Dary, dwell., 30′ x 52′, two-st'y; Wilson Bros., builders.

Pynchon St., rear of, near Tremont St, for Metropolitan R. R. Co., 24′ x 50″.

Brick. — *Trumbull St., No.* 21, for Bridget Goldie, dwell., 35′ x 60′, three-st'y flat; Jeremiah J. Spillans, builder.

Chauncy St., Nos. 30 *and* 32, for W. S. Dexter, mercantile, 23′ 9″ x 106′, five-st'y flat; M. S. & G. N. Miller, contractors.

Chauncy St., cor. Rowe Pl., for David and Henry C. Nevins, mercantile, 53′ x 86′, six-st'y; Timothy E. Stuart, builder.

Brooklyn.

BUILDING PERMITS. — *North Twelfth St.*, n s, 175 w Second St., brick chimney, 20′ x 6′ at base and 16′ x 4′6″ at top; cost, $2,300; owners, C. C. Reed & Co.; builder, Wm. L. Langridge, Jr;

Quincy St., n s, between Yates and Lewis Aves., 3 three-st'y brownstone dwells.; cost, $6,000 each; owner, A. G. Vandewater, 450 Fifth St.

Plymouth St., n s, 70.5 w Pearl St., rear, three-st'y brick storehouse; cost, $5,000; owner, E. W. Bliss; builders, M. Reed and E. Snedeker.

North Seventh St., n s, 100 w Seventh St., three-st'y frame tenement; cost, $3,500; owner, William Coit, 215 Carroll St.; architect, Baldwin Petit; builders, Bruce & Dickerson and Baldwin Petit.

Monroe St., 350 w Yates Ave., two-st'y brick dwell.; cost, $4,000; owner, Samuel Organ, 547 Monroe St.; architect, R. B. Eastman; builder, J. De Revere.

Baltic St., s e cor. Nevins St., one-st'y brick moulding-mill; cost, $5,000; owner, John S. Loomis, 325 President St.; architect, David R. Long; builders, Nash & Purtell.

On Dock, between Broadway and South Sixth St., two-st'y brick factory, etc.; cost, $20,000; owner, New York Ferry Co., foot Broadway; architect, W. B. Ditmars; builders, Griffith J. Roberts and Jenkins & Gillies.

Second Ave., w s, near 6th St., two-st'y frame factory; cost, $2,800; owners, Chambers Bros.; architect and builder, H. E. Fickett.

Ninth St., s w cor. Seventh Ave., 3 three-st'y brownstone dwells.; cost, $7,000 each; owner, P. Mullady, 576 Quincy St.; builders, John Assip and P. Ward.

Butler St., n s, 260 e Nevins St., two-st'y frame sash and blind factory; cost, $3,500; owner, etc., Stanley Muckles, 572 Pacific St.

Commercial St., n s, 200 e Ann St., two-st'y brick machine-shop; cost, $3,000; owner, Havemeyer Sugar Refining Co.; mason, J. B. Woodruff.

Lafayette Ave., n s, bet. Tompkins and Marcy Aves., 2 three-st'y brownstone dwells.; cost, $8,250 each; owner, William Leinken, 202 South St., New York; architect and builder, John H. Smith.

Elm St., No. 31, three-st'y frame tenement; cost, $3,500; owner, Henry Steinmann, cor. North Ninth and Fifth Sts.; builder, John Rueger.

Columbia St., e s, 73 s Ninth St., three-st'y brick

(*Continued on next page.*)