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CONTENTS.

IT will not be amiss to call the attention of those interested to the approaching meeting of the Convention of the American Institute of Architects, which is expected to take place November 17, in Philadelphia. Several matters of great general interest are to be decided at the coming session. To say nothing of the new business which may be brought up, definite action will probably be taken upon questions discussed in the Convention of 1879 and laid over to the present year. The principal one among these is the proposed revision of the constitution of the Institute, and the dissolution of all organic connection between it and the local societies. Several different schemes will probably be offered for the remodelling of the constitution, which will, whatever plan is adopted, be a momentous event in the history of architecture in the United States. No one can regard such a step without some apprehension, and a full meeting of the Convention which will have to decide upon it is very desirable. Besides this important business, special reports are to be presented upon colonial architecture and on the construction of tenement-houses, by committees appointed for the purpose at the last convention, and it is hoped that a number of interesting papers will be read and discussed. We shall be able to give more particulars as to many points when we receive the official circular, but it is not too early to direct the attention of the members of the Institute, which, it must be remembered, includes *all* the members of Chapters in full standing, to the unusual importance of this occasion.

A STRANGE state of affairs has been brought about in Paterson, N. J., by the prolonged drought. It seems that the Passaic river, which not only supplies the city water-works, but also a number of factories along its banks, is crossed just above the town by a dam, which belongs to the Society for the Promotion of Useful Manufactures. This society is bound by contracts to supply the manufacturers with a certain amount of power, but as there is ordinarily a large surplus supply the city water company had made a subsequent contract for the use of this surplus. Now, however, the river is so low that it no longer flows over the dam, and no water reaches the company's pumps. The city is therefore left without a supply, and the deprivation is rendered all the more exasperating by the sight of the blue lake above the dam, and the revolving wheels of the mills. The society is bound by its contracts, and cannot violate them by lowering the dam, and the individual manufacturers are unwilling to make the sacrifice of closing their works to allow the city to use their supply. Meanwhile, the insurance agents of the city have met, and in view of the inadequacy of the supply which the water company can now furnish for extinguishing fires, have resolved, unless some arrangement is made at once, to cancel all the policies in the city issued through them. This would be a harsh measure, but the agents claim that as the insurance was effected on the understanding that there should be a supply in the street pipes, they are justified in adopting it, and the question is discussed whether in this case the water company could not be held responsible for damage by fires, if any should occur under the circumstances. That is an interesting inquiry, perhaps, but we trust it will not be brought to a practical test, and that the unfortunate situation will soon be over.

PARIS, considered as a work of sanitary engineering, is distinguished from all other modern cities in one respect, — the great dimensions of the sewers which drain it. The common modern theory in regard to sewers is that a tube of comparatively small calibre, which will be frequently filled nearly to its utmost capacity, is more easily kept clean, on account both of its small extent of interior surface liable to gather foul sediment, and also by reason of the greater scouring action of a given flow concentrated in a small pipe. Drain pipes of small diameter are, moreover, cheap, and can be made of a glazed material which is easily kept free from deposit by the movement of sewage, so that, with man-holes at suitable intervals, a system can be constructed which admits of all needed supervision, and is at the same time economical and efficient. The Parisian theory, on the contrary, regards the accessibility for minute inspection of every part of the drainage system as essential, and the sewers are in that city treated as sub-ways, so to speak, through which the inspectors can pass continually to and fro, to observe and remedy obstructions or other disorders. These large conduits serve also for the passage of lines of water and gas pipes, and telegraph wires, which can thus be carried quietly through the city without any of that tearing up and obstruction of streets, or erection of disfiguring structures, which cause so much annoyance in other towns. For this reason, if for no other, the great cost of these subterranean passages is perhaps, in a long run, justified; at least the French think so, and a great extension of the present system has been determined upon, so vast, indeed, that, in the words of *L'Architecte*, there will ultimately be no public street in the central part of the city, without its corresponding sub-way. It is perhaps pardonable to remark that the present sewer facilities have not saved Paris this summer from noisome exhalations which have caused loud complaints, but the enlargement of the system may possibly work some amelioration of the trouble, and we can at least admire the greatness of the enterprise as a work of pure construction.

ASIDE from its singular aspect, regarded as a political movement, the great celebration of October 15 and 16, in honor of the completion of Cologne Cathedral, must have been a most imposing and suggestive ceremony. The ancient civic or provincial pride which centred around the great diocesan churches has long ago vanished from all the rest of the world, only to make the mediæval enthusiasm of Cologne more conspicuous, and on these crowning days of its glory all Germany is ready to join in a demonstration which appeals no less to the patriotic pride than to the romantic sympathies of the nation. As might be expected in these days, the affair was from the first placed under the auspices of the high aristocracy. The very date of the celebration was chosen as being the birth-day of the late king Frederick William the Fourth, of Prussia, and the procession to the building was headed by the Emperor and Empress of Germany, and included nearly all the princes of the empire. By a characteristically modern compromise, a Protestant service was held in the Trinity Church, followed by a Te Deum in the Cathedral from the Catholic bishop and chapter. One feature of the day was to be the hoisting of the imperial standard upon the spire, a ceremony which the more devout among the spectators might be glad to have dispensed with. Some of them would be likely to think of the days when all earthly standards were lowered before the Cross, and would regard the flaunting of the Prussian banner over the venerable edifice as little short of desecration.

THE *Fireman's Journal* calls attention to the increasing numbers and great destructiveness of fires in which petroleum or its products serve to feed or spread the flames. One of the most signal examples of the dangers which may be feared from this source is found in the recent fire at Williamsburgh, New York, where a few barrels of benzine, stored on board a small vessel, were inflamed through the ignition of the almost explosive vapor which found its way through the casks, and bursting, one after the other, scattered flakes of the burning

liquid over the river, to be carried by the tide into the midst of the wharves and shipping, causing an ultimate destruction of property to the amount of a million and a half of dollars. There is something appalling in the thought of an incendiary element so fierce that none of the ordinary appliances can extinguish it, so light and subtle that a deluge of water only serves to distribute and multiply its destructiveness, and so intense in its action that no fireman can endure the heat which it radiates while burning. The *Journal* thinks that a careful study of the conditions which this new problem presents is absolutely necessary. It offers itself a valuable observation, — that although the actual flames of petroleum are not in the least affected by water, much may be done in the way of cooling the tanks, or other receptacles in which it is stored, and thereby checking the vaporization of the liquid, without which it cannot ignite. This suggestion should be remembered, not only by firemen, who may have to extinguish such conflagrations, but by architects and others, who may be called upon to construct or arrange places for the storage of inflammable fluids.

An extraordinary demand has recently sprung up in New York for tube wells, not the deep artesian wells, of which a certain number have been bored within a few years, but those so popular in our sandy sea-coast regions, consisting of a small iron pipe with a perforated point, driven forty or fifty feet into the ground by simple hammering. It is said that beneath the upper soil of the island, which is gravelly, extends a bed of clay, and that under this is a porous stratum, at an average depth of forty feet from the surface, which yields an abundant supply of pure water, protected against contamination from surface drainage by the impervious clay above it, and much cooler, on account of the depth at which it lies, than the Croton from the city mains. As a tube can be driven to reach this source for about two hundred dollars, it is not surprising that many establishments are glad to avail themselves of it. One flouring mill alone draws three hundred thousand gallons per day from five of these wells, saving some ten thousand dollars per year, which the same amount of Croton water would cost. Brewers, in particular, find a considerable advantage in using the well-water on account of its low temperature. Much of the consumption in breweries is for the purpose of cooling the vats, and great quantities of ice are used to reduce the water so employed to a suitable temperature, so that the difference between that from the wells at fifty-six degrees Fahrenheit and the Croton at seventy to eighty degrees, represents a large saving in ice, independent of the cost of the water.

Mr. Jacob Wrey Mould, who was for a long time architect to the New York Central Park Commissioners, and did much toward the adornment of their beautiful grounds, has received a similar appointment in connection with the Morningside Park, which is to be put at once into a finished condition. To Mr. Vaux is due the credit of a large — perhaps the largest — part of the architectural work in the Central Park, but many of its richest, as well as its most graceful and picturesque ornaments, were designed by Mr. Mould, and we shall be glad to see the same skilful hand engaged in heightening by beautiful designs the great natural picturesqeness of the neighboring tract. New York has reason to be proud of its parks. Through all changes of parties and officials, these gardens of the people have never been neglected, but have grown more attractive year by year. Perhaps all that has been done in them is not in perfect taste, but it has at least been done with the best intentions, and if we laugh a little at the miscellaneous character of the objects with which the citizens are so eager to adorn them, we are forced to acknowledge and respect the universal feeling which finds expression in these motley offerings.

Mr. Charles Barry, who, as our readers will remember, acted as judge in the competition for the Glasgow Municipal Buildings, was the subject of a good deal of unmerited criticism on account of his inflexibility in throwing out the designs which in his opinion would materially exceed in cost the model plan which was drawn up by the city architect. More recently he seems to have brought still worse trouble on himself by what the *Architect* would call his "generous sympathy" in the case of another competition, that for the Westminster Vestry Hall, in which also he was referee. The design here placed first not only violated the conditions by being represented in drawings at a scale of one-quarter of an inch to the foot, instead of the stipulated one-eighth, but would, Mr. Barry thought, cost much more than the amount prescribed. Perhaps there were circumstances unknown to us which should properly influence the referee's judgment, but it certainly seems as if such violations of the conditions should exclude the designers who were guilty of them from the competition. As the *British Architect* justly says, "The price is the real basis of the design for any building. To exceed the stipulated price is quite as unpardonable as to exceed the limits of the site." A variation of five per cent or so it of course would not consider fatal, but we cordially agree with it in thinking that an excess of twenty per cent or more, such as is frequently seen, "is so flagrant a departure from the initial condition, that to reward any competitor guilty of this excess is so great an injustice to those competitors who have cut their coats according to their cloth, that we cannot believe Mr. Barry can have so far forgotten what was due to himself, setting aside what was due to his competing brethren, as to have been guilty of it."

The contractors for the construction of the St. Gothard tunnel have, it is said, applied to the "Federal tribunal" to have the time for the completion of their work postponed for seven hundred days after the stipulated time, which would defer the actual opening of the line until late in 1883. We should be glad to see every possible favor shown to the contractors, who have prosecuted their adventurous undertaking with signal courage and persistency in the face of extraordinary, and as the event has proved, ruinous difficulties, and so far as appears, they have a good claim to an extension of time on acount of the neglect of the railway company, the other party to the contract, to fulfil their agreements in regard to payments and the furnishing of facilities for transportation. Perhaps this reported appeal to judicial authority is merely an effort to obtain a conclusive decision as to the amount of time which ought to be allowed to offset the shortcomings of the railroad company, and thereby forestall the claim which the latter proposes to make for the heavy forfeiture which will, under the agreement, be due to it from the contractors for every day's delay beyond a specified date, — April 1, 1881, we believe. The sympathies of the Swiss public in general are strongly with the contractors, and it will be by no means surprising if the full respite which they desire is allowed.

A story is told in a French paper about the troubles of an unfortunate workman, with a taste for litigation, who not only got much less by going to law than he might have had through amicable negotiation, but had to pay the costs of two suits besides. This man, "the Sieur Colas," as the court called him, was a quarryman, engaged in getting out native gypsum for his employer, the Sieur Bondoux, when he was disabled by some accident. Bondoux, after a custom quite prevalent on the continent, had been in the habit of retaining a fixed percentage from all his workmen's wages, and depositing it with a certain accident insurance company, the Préservatrice, as premium on what might be called a "blanket policy," covering his whole corps of workmen, but Colas, instead of contenting himself with the indemnity that he was entitled to under this policy, saw fit to sue his employer for the gross sum of fifteen thousand francs, as damages. This action was promptly defeated, it being proved that his mishap was due entirely to his own carelessness. His next step was to attack the Préservatrice company, from which he demanded the annual indemnity of three hundred francs to which his share of the premium paid would entitle him. This move, as any lawyer might predict, was checked even more suddenly than the other, the court declaring that as the company had made no contract with him, but only with Bondoux, into whose application of the indemnity money which he received it did not enter, there was no *vinculum juris*, or legal relation, between it and the Sieur Colas, which would entitle him to compel the performance of its contract. The judge, in ordering a non-suit, the plaintiff to pay the costs, remarked that he was still entitled to sue Bondoux for the indemnity which the insurance company was bound to pay him, and which he would ordinarily be in turn bound to pay Colas, and could perhaps recover, unless, indeed, his previous suit against Bondoux had worked a forfeiture of his claim through him upon the Préservatrice, under its regulations, but Colas seems not to have wished to tempt further the uncertainties of the law.

THE OPEN FIRE-PLACE. — XXIV.

APPENDIX. — MISCELLANEOUS EXAMPLES.

Fig. 249. Fire-Place in a house at Sarlat.
From "L' Art Architectural en France." Time of Henri II.

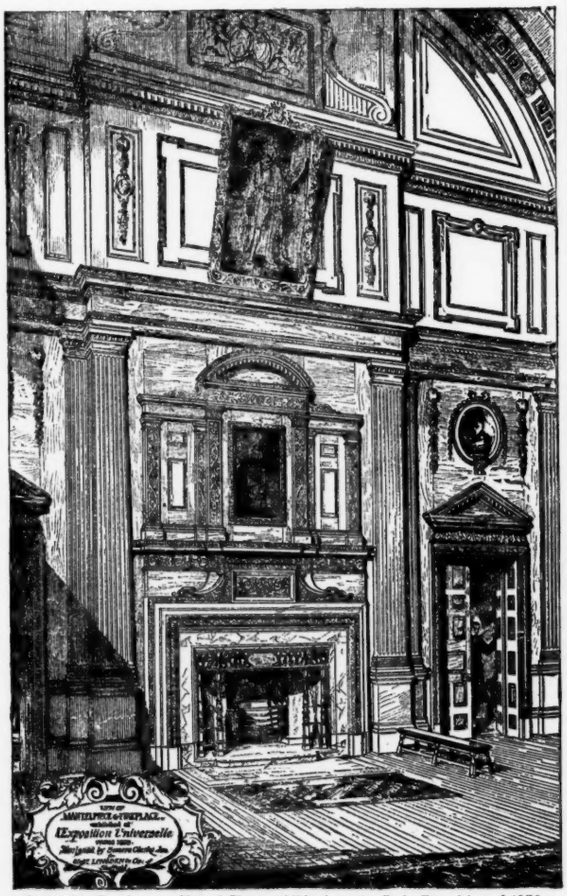


Fig. 250. Renaissance Mantel-Piece exhibited at the Paris Exposition of 1878.

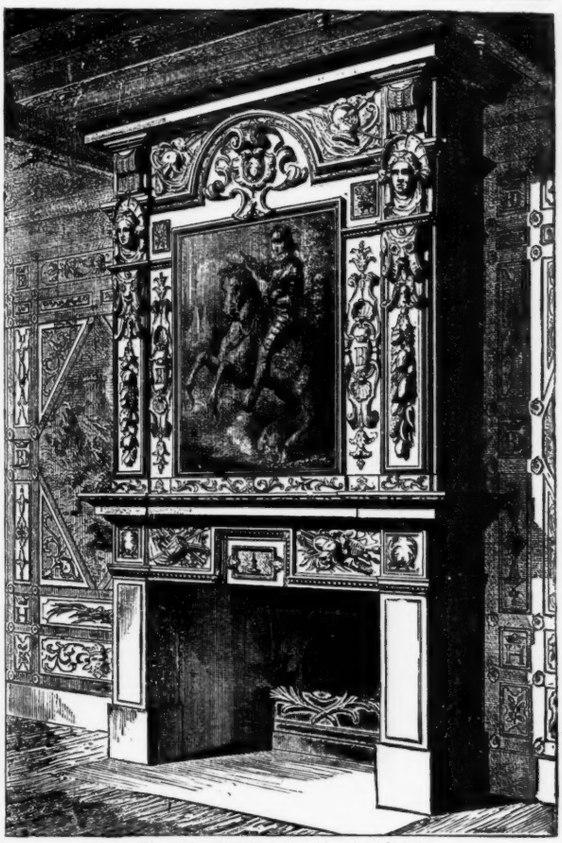


Fig. 251. Fire-Place in a French Château.
From *L' Art Pour Tous.*

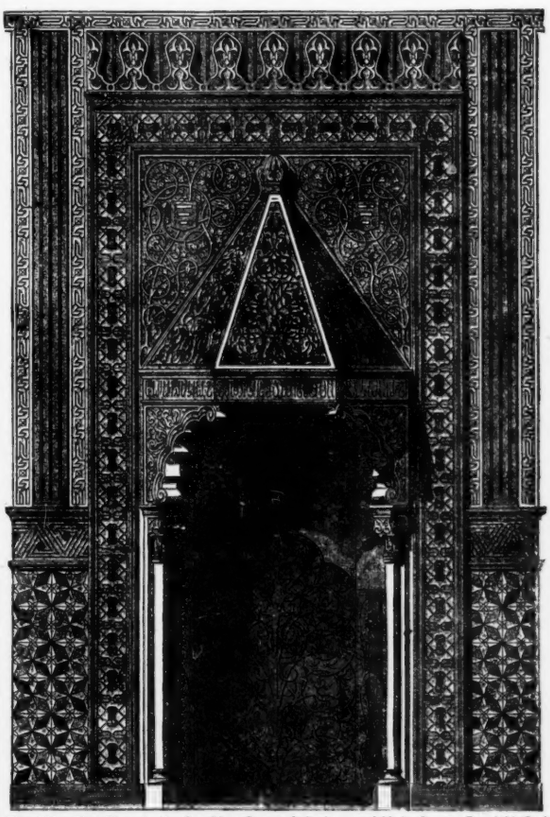


Fig. 252. Fire-Place in the Smoking-Room of the house of M. le Comte Branicki, Paris.
F. Roguet and L. C. Bolleau, Architects. "Encyclopedie d' Architecture."

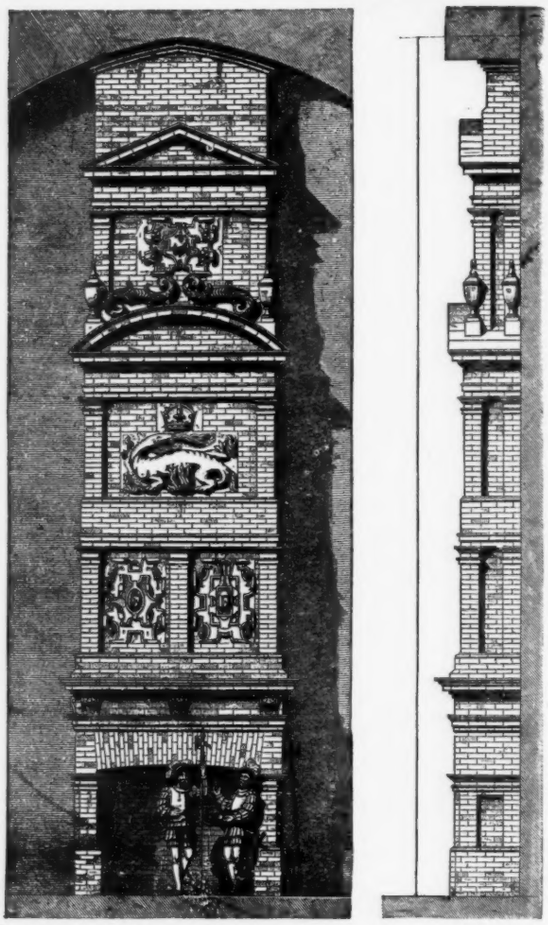


Fig. 253. Fire-Place in the Salle de Mars, Château de François I, at St Germain-en-Laye. XVI Century.
From "Les Palais et Châteaux de France."

THE ARCHÆOLOGICAL INSTITUTE OF AMERICA.

The new Archæological Institute has taken a strong hold on life and is evidently determined to lose no time in showing a reason for its existence. To many persons, doubtless, who read its preliminary circular in April of last year, it was a new Society of Dilettanti, whose prospectus promised an elegant and languid participation in whatever investigations might be set on foot of the remains of the pre-historic races of our own continent, or of the inedited antiquities of classic sites. Few imagined, we presume, that within a year from the organization of the institute it would be printing a report like that now before us, asking for the means to carry out a definite and well-considered enterprise in the way of exploration and research, and accompanying its report with original papers descriptive of archæological studies in regions so widely separated as New Mexico, Italy and Asia Minor.

Mr. Morgan's interesting paper is a *résumé* of what knowledge exists respecting the house-building of the various Indian tribes inhabiting the North American continent before its discovery by Europeans, with a view to enforcing the theory entertained by its author, "that all the tribes of the American aborigines were of one common stock, that their institutions, plan of life, usages and customs were similar, and that the houses in ruins in the various places named, can be explained by comparison with those now existing in New Mexico, as parts of a common system of house architecture."

Following this theory, Mr. Morgan maintains, with something more than confidence, that all the ruins of New Mexico and Arizona, as well as those in Central America and Yucatan, are simply ruins of "joint-tenement houses, of the aboriginal American type," now called "Pueblos," in which great numbers of families lived together, after a fashion which it is now, perhaps, impossible to determine with certainty. In one of these, Pueblo Bonita, in New Mexico, the number of apartments is reckoned at over six hundred. We dare say Mr. Morgan is quite right in his theory, but we are sorry that he finds it necessary to speak of his predecessors in the same field of inquiry, with that contempt which investigators in whatever science commonly think it proper to show for their foregoers. The committee have, as they say, "taken steps to prepare for sending out to Colorado and New Mexico, an agent properly qualified by character and education for the study of the life of the village Indians in this region," and they estimate the cost of fitting out and maintaining such an expedition at not far from four thousand dollars.

Mr. Stillman's report of his slight and hasty examination of the scanty remains of Monte Leone, has little or no value further than as it seems to establish the improbability of any result from investigations on that ground.

Mr. Clarke's contribution, which finishes the volume, is a very agreeable and scholarly sketch of the traces of ancient Roman life to be found along the shores of the Danube, the Black Sea, the Bosphorus and the Ægean. Mr. Clarke is a true explorer, and his account is full of interest. He strongly urges an organized investigation of the ruins of Assos, and is confident that such an enterprise would be rewarded by great results. Perhaps this is the spot the committee have in mind when they say that after much consideration of the various sites which seem to promise success to the explorer, they have, in consonance with the advice of Prof. Ernst Curtius, selected one as especially alluring, and are ready to commence work with vigor as soon as they shall have received the necessary means. About eight thousand dollars is considered to be the smallest amount which will properly serve the purpose, and the committee are not without hope that such a sum may be furnished. And indeed, since the appearance of the report, the committee now announce through the newspapers that they "are now making arrangements for the investigation of the remains of an ancient Greek city on Turkish soil. The necessary concession from the Turkish government has been applied for through the Department of State, and there is no reason to doubt that it will be obtained. It is probable that the work will begin with the opening of the spring in February. The expedition will have at its head Joseph T. Clarke, and as his first assistant, Francis H. Bacon," and they call for volunteers to accompany the expedition.

It is delightful to see the new Institute taking so vigorous an initiative in this interesting work, and we hope it will be able to increase its membership to a number which will furnish it with the necessary means for accomplishing the enterprises it has proposed to itself. It has begun naturally with a small membership, and until this shall have grown much larger than can reasonably be expected for some years, must look for funds to the donations of its liberal and wealthy friends. The committee reckon that a membership of two thousand would supply an income ample "for the successful prosecution of tasks of the highest interest."

We felicitate the community on this promising undertaking. It is easy to smile at the foibles of archæologists, at the exaggerated importance they are prone to attach to every doubtful scratch on a marble wall, or to every rudest detail of broken pottery, at their "ill-advised asperity" towards other laborers in the same field — a weakness from which one might suppose the placid nature of their researches would preserve them, but which is common, alas, to all specialists, and which perhaps, as lending a certain vivacity to their pursuits, is not altogether to be deplored. But we must gladly admit that such studies as the new Institute is to encourage, valuable and interesting everywhere, are especially valuable in our American communities, not more for the knowledge which they add to the general sum, than for the tranquilizing and civilizing influence which they exert on the hot and restless spirit of American life, for their tendency to "slow the machine," and to make life longer, not by making it duller, as some witty Englishman has said of moralists and sermon-writers, but by making it quieter.

[1] *Archæological Institute of America.* First annual report of the Executive Committee, with accompaning papers. Cambridge, J. Wilson & Son.

BRIDGE DISASTERS IN AMERICA.[1] — I.

A few years ago an iron highway bridge at Dixon, Ill., fell, while a crowd was upon it, and killed sixty persons. The briefest inspection of that bridge by any competent engineer would have been sure to condemn it. A few years later the Ashtabula bridge, upon the Lake Shore Railroad, broke down under a passenger train, and killed from eighty to one hundred passengers. The report of the committee of the Ohio Legislature appointed to investigate that disaster concluded, first, that the bridge went down under an ordinary load, by reason of defects in its original construction; and, secondly, that the defects in the original construction of the bridge could have been discovered at any time after its erection, by careful examination. Hardly had the public recovered from the shock of this terrible disaster when the Tariffville calamity added its list of dead and wounded to the long roll already charged to the ignorance and recklessness which characterizes so much of the management of the public works in this country. . . .

It has been very correctly remarked that in order to bring a disaster to the public notice, it must be emphasized by loss of life. The Ashtabula bridge fell and killed over eighty persons, and a storm of indignation swept over the country from one end to the other. No language was severe enough to apply to the managers of the Lake Shore Railroad; but if that very bridge had fallen under a freight train, and no one had been injured, the occurrence would have been dismissed with a paragraph, if, indeed, it had received even that recognition. In February, 1879, a span, 110 feet long, of an iron bridge on the Chicago & Alton Railroad, at Wilmington, Ill., fell, as a train of empty coal cars was passing over it, and three cars

[1] Portions of a paper by Prof. G. L. Vase, published by the *Railroad Gazette.*

were precipitated into the river, a distance of over thirty feet. No one was injured. Not a word of comment was ever made in regard to this occurrence. Suppose that in place of empty coal cars the train had consisted of loaded passenger cars, and that one hundred persons had been killed. We know very well what the result would have been. Is not the company just as much to blame in one case as in the other? On the night of the 9th of November last, one span of the large bridge over the Missouri River, at St. Charles, upon the St. Louis, Kansas City & Northern Railway, gave way as a freight train was crossing it, and seventeen loaded stock cars and the caboose fell a distance of eighty feet into the river. Two brakemen and two drovers, who were in the caboose, were killed. The bridge, says the only account that has appeared, did not break, apparently, for the whole span went down with the cars upon it. It could hardly make much difference, we should suppose, to the four men who were killed, whether the bridge *broke* down or *went* down. This disaster occurred early last November, and not a word has appeared in the papers since in regard to it. Suppose that in place of seventeen stock cars half-a-dozen passenger cars had fallen from a height of eighty feet into the river, and that in place of killing two brakemen and two drovers, two or three hundred passengers had been killed. Is not the general public just as much concerned in one case as in the other?

Suppose that a bridge now standing is exactly as unsafe as the Ashtabula bridge was the day before it fell; would it be possible to awaken public attention enough to have it examined? Probably not. A short time since, the writer endeavored to induce one of the leading dailies in Massachusetts to expose a wretchedly unsafe bridge in New England; but the editor declined, on the ground that the matter was not of sufficient interest for his readers; but less than a month afterward he devoted three columns of his paper to a detailed account of a bridge disaster in Scotland, and asked why it was that such things must happen, and if there was no way of determining in advance whether a bridge was safe or not. This editor certainly would not maintain that, in itself, it was more important to describe a disaster after it had occurred, than to endeavor to prevent the occurrence; but, as a business man, he knew perfectly well that his patrons would read an account giving all of the sickening detail of a terrible catastrophe, while few, if any, would wade through a dry discussion of the means for protecting the public from just such disasters. The public is always very indignant with the effect, but does not care to trouble itself with the cause; but the effect never will be prevented until the cause is controlled, and the sooner the public understands that the cause is in its own hands, to be controlled or not, as it chooses, the sooner we shall have a remedy for the fearful disasters which are altogether too common in the United States.

In a country where government controls all matters on which the public safety depends, and where no bridge over which the public is to pass is allowed to be built except after the plans have been approved by competent authority, where no work can be executed except under the rigid inspection of the best experts, nor opened to the public until it has been officially tested and accepted, it makes little or no difference whether the public is informed or not upon these matters; but in a country like the United States, where any man may at any time open a shop for the manufacture of bridges, whether he knows anything about the business or not, and is at liberty to use cheap and insufficient material, and where public officers are always to be found ready to buy such bridges, simply because the first cost is low, and to place them in the public ways, it makes a good deal of difference. There is at present in this country absolutely no law, no control, no inspection, which can prevent the building and the use of unsafe bridges, and there never will be until the people who make the laws see the need of such control. There is no one thing more important in this matter than that we should be able to fix precisely the responsibility, in case of disaster, upon some person to whom the proper punishment may be applied. If every railway director, or town or county officer, knew that he was held personally accountable for the failure of any bridge in his charge, we should soon have a decided improvement in these structures. If we could show that a certain bridge in a large town had been, for a long time, old, rotten, worn-out, and liable at any moment to tumble down, and could show, in addition, that the public officers having charge of such a bridge knew this to be the case, and still allowed the public to pass over it, we can see at once that in case of disaster the blame would be clearly located, and the action for damage would be short and decisive. Once let a town have heavy damages to pay, and let it know at the same time that the town officers are clearly accountable for the loss, and it is possible that it would be willing to adopt some system that should prevent the recurrence of such an outlay.

To see what may be accomplished by an efficient system of public inspection, it is necessary to know something in regard to the structures to be inspected. We have now in common use in this country, both upon our roads and our railroads, bridges made entirely of iron, bridges of wood and iron combined, and occasionally, though not often now-a-days, a bridge entirely of wood; and these structures are to be seen of a great variety of patterns, of all sizes, and in every stage of preservation. American engineers have always excelled in this branch of their business, being unsurpassed by any other nation. Of late years, so great has been the demand for bridge work that this branch of engineering has become a trade by itself, and we find immense works, fitted up with an endless variety of the most admirably adapted machine-tools, devoted exclusively to the making of bridges of wood, iron, steel, or all combined. As in all division of labor, the result of this specialization has been to improve vastly the quality of the product, to lessen the cost, and to increase the demand, until many of our large firms reckon the length of bridging which they have erected by miles, instead of feet. As usual, however, in such cases, unprincipled adventurers are not wanting, who, taking advantage of a great demand, do not hesitate to fit up cheap shops, to buy poor material, and to flood the market with a class of bridges made with a single object in view; viz., to sell, relying upon the ignorance of public officials for custom. Not a year passes in which some of these wretched traps do not tumble down and cause a greater or less loss of life; and at the same time, with uninformed people, throw discredit on the whole modern system of bridge-building. This evil affects particularly highway bridges. The ordinary county commissioner or selectman considers himself amply competent to contract for a bridge of wood or iron, though he may never have given a single day of thought to the matter before his appointment to office. The result is that we see all over the country a great number of highway bridges which have been sold by dishonest builders to ignorant officials, and which are on the eve of falling, and await only an extra large crowd of people, a company of soldiers, a procession, or something of the sort to break down. . . .

An impression exists in the minds of many persons that an iron bridge is necessarily a strong bridge. This is a great mistake. There are good iron bridges and there are also very poor ones. A good iron bridge is the best bridge one can buy; but a poor iron bridge is the worst — much worse than a poor wooden one; for when an iron bridge falls it is apt to go all at once, but a wooden one shows signs of failure long before it actually gives way. Another fallacy which infests some persons is the notion that it is purely a matter of opinion whether a bridge is safe or not. In nine cases out of ten it is not at all a matter of opinion, but a matter of fact, and of arithmetic. . . .

Few persons are aware of the weight of a closely packed crowd of people. Mr. Stoney, one of the best authorities, packed 30 persons upon an area of $29\frac{4}{10}$ square feet, and at another time he placed 58 persons upon an area of 57 square feet. In the first case, the result was a load of 149 lbs. per square foot, and in the second case a load of $147\frac{4}{10}$ lbs. per foot. "Such cramming," says Mr. Stoney, "could scarcely occur in practice, except in portions of a strongly-excited crowd; but I have no doubt that it does occasionally so occur." "In my own practice," he continues, "I adopt 100 lbs. per square foot as the standard working load, distributed uniformly over the whole surface of a public bridge, and 140 lbs. per square foot for certain portions of the structure; such for example as the foot-paths of a bridge crossing a navigable river in a city, which are liable to be severely tried by an excited crowd during a boat-race, or some similar occasion." Tredgold and Rankine estimate the weight of a dense crowd at 120 lbs. per square foot. Mr. Brunel used 100 lbs. in his calculations for the Hungerford Suspension Bridge. Mr. Drewry, an old but excellent authority, observes "that any body of men marching in step at from 3 to $3\frac{1}{2}$ miles an hour will strain a bridge at least as much as double the same weight at rest;" and he adds: "In prudence not more than one-sixth the number of infantry that would fill a bridge should be permitted to march over it in step." Mr. Roebling says, in speaking of the Niagara Falls Railroad suspension bridge: "In my opinion, a heavy train, running at a speed of twenty miles an hour, does less injury to the structure than is caused by twenty heavy cattle under full trot. Public processions, marching to the sound of music, or bodies of soldiers keeping regular step, will produce a still more injurious effect."

Evidently a difference should be made in determining the load for London Bridge and the load for a highway bridge upon a New England country road in a thinly settled district. A bridge that is strong enough is just as good and just as safe as one that is ten times stronger, and even better; for in a large bridge, if we make it too strong, we make it at the same time too heavy. The weight of the structure itself has to be sustained, and this part of the load is a perpetual drag on the material. In 1875, the American Society of Civil Engineers, in view of the repeated bridge disasters in this country, appointed a committee to report upon "The Means of Averting Bridge Accidents." We might expect, when a society composed of some hundreds of our best engineers selects an expert committee of half-a-dozen men, that the best authority would be pretty well represented, and such was eminently the case. It would be impossible to have combined a greater amount of acknowledged talent, both theoretical and practical, with a wider and more valuable experience, than this committee possessed. The first point taken up in the report is the determination of the loads for which both railroad and highway bridges should be proportioned. In regard to highway bridges, a majority of the committee reported that for such structures the standard loads should not be less than as shown in the following table:

Span.	Pounds per square foot. Class A.	Class B.	Class C.
60 feet and less	100	100	70
60 to 100 feet	90	75	60
100 to 200 feet	75	60	50
200 to 400 feet	60	50	40

Class A, includes city and suburban bridges, and those over large rivers where great concentration of weight is possible; Class B denotes highway bridges in manufacturing districts, having well

ballasted roads; and Class C refers to ordinary country roads bridges, where travel is less frequent and lighter. A minority of the committee modified the table above by putting all highway bridges into the first class, and by making the loads larger by a small amount. The whole committee agreed in making the load per square foot less as the span is greater, which is of course correct. It would seem eminently correct to make a difference between a bridge which carries the continuous and heavy traffic of a large city and one which is subjected only to the comparatively light and infrequent traffic of a country road. At the same time it should not be forgotten that in a large part of the United States a bridge may be loaded by ten, twenty or even thirty lbs. per square foot by snow and ice alone, and that the very bridges which from their location we should be apt to make the lightest are those which would be most likely to be neglected, and not relieved from a heavy accumulation of snow. In view of the above, and remembering that a moving load produces a much greater strain upon a bridge than one which is at rest, we may be sure that, as the committee above referred to recommend, the loads should not be less than those given in the table. We can easily see that in special cases they should be more.

There is another point in regard to the loading of a highway bridge which is to be considered. It often happens that a very heavy load is carried over such bridges upon a single truck, thus throwing a heavy and concentrated load upon each point as it passes. Mr. Stoney states that a wagon with a crank shaft of the British ship Hercules, weighing about forty-five tons, was refused a passage over Westminster iron bridge, for fear of damage to the structure, and had to be carried over the Waterloo Bridge, which was of stone, and he says, that in many cases large boilers, heavy forgings or castings, reach as high as twelve tons upon a single wheel. The report of the American Society of Engineers, above referred to, advises that the floor system be strong enough to carry the following loads upon four wheels: on Class A, twenty-four tons; Class B, sixteen tons, and Class C, eight tons; though it is stated that these do not include the extraordinary load sometimes taken over highways. "This provision for local loads," says Mr. Boller, one of the committee, "may seem extreme, but the jar and jolt of heavy springless loads comes directly on all parts of the flooring at successive intervals, and admonishes us that any error should be on the safe side."

To pass now to railroad bridges, we find here a very heavy load coming upon the structure in a sudden and often very violent manner. Experiment and observation both indicate that a rapidly-moving load produces an effect equal to double the same load at rest. This effect is seen much more upon short bridges, where the moving load is large in proportion to the weight of the bridge, than upon long spans, where the weight of the bridge itself is considerable. The actual load upon a short bridge is also more per foot than upon a long one, because the locomotive, which is much heavier than an equal length of cars, may cover the whole of a short span, but only a part of a longer one. The largest engines in use upon our railroads weigh from 75,000 to 80,000 lbs. on a wheel-base not over twelve feet in length, or 2,800 lbs. per foot for the whole length of the engine, and from 20,000 to 24,000 lbs. on a a single pair of wheels. The heaviest coal trains will sometimes weigh nearly a ton per lineal foot, the ordinary freight trains from 1,600 to 1,800 lbs., and passenger trains from 1,000 to 1,200 lbs. per foot. Any bridge is liable to be traversed by two heavy freight engines, followed by a load of a ton to the foot, so that if we proportion a bridge for 3,000 lbs. per foot, for the total engine length, and for a ton per foot for the rest of the bridge, bearing in mind that 80,000 lbs. may come upon any twelve feet of the track, and that any one point may be called upon to sustain 24,000 lbs., and regarding the increase of strain on short spans due to high speeds, we have the following loads for different spans, exclusive of the weight of the bridge:

Span.	Lbs. per foot.	Span.	Lbs. per ft.
12	7,000	50	3,000
15	6,000	100	2,800
20	4,800	200	2,600
25	4,000	300	2,500
30	3,600	400	2,450
40	3,200	500	2,400

The above does not vary essentially from the English practice, and is substantially the same as given by the Committee of the American Society of Civil Engineers.

FRÉJUS.

Among the dead cities of the decaying Provençal seaboard there are few more curiously and more hopelessly decayed than Fréjus. Lying outside the commercial revolution which has regenerated the coast from Marseilles to Toulon, as well as outside the tidal wave of invalids which now breaks yearly over the eastern shore from Cannes to Nice, it occupies the centre of an intermediate neglected belt, where memories of the past alone are likely to tempt the passing tourist. Indeed, the once great and busy Roman port of Forum Julii has now not a single moderately good inn at which even the most hardy archæologist would venture to pass a night of sleepless discomfort. Fréjus can only practically be visited by day trips from Cannes, and the wise explorer will even then provide himself with luncheon before leaving home, rather than trust to the slender capabilities of the Julian *cuisine*. But if he is content to leave for a while the exquisite scenery of the gulf and islands for the somewhat desolate alluvial delta of the Argens, he will find much to interest and still more to instruct him in the unsavory relics of the famous colony.

Modern Fréjus has few rivals even in Provence for the narrowness, the dirt, and the discomfort of its streets. Such an abundance and variety of evil odors can hardly be found in any other town of France. The tourist who comes to visit it with his mind full of historical recollections, who expects to find some halo of the Phocæan settlers still clinging around their ancient home, will have his anticipations rudely shocked by the sights and smells which assail him on the way from the railway station to the Porte Dorée. The streets are now unnecessarily encumbered with unwholesome rubbish, and seem utterly neglected even by those Republican authorities who have taken upon themselves so vigorously the task of regenerating the towns of France. The Amphitheatre, just outside the town, and classed amongst the protected historical monuments, is in itself a fine ruin, which would thoroughly repay intelligent care, such as that so well bestowed at Nimes and Arles, in clearing out its encumbered arcades. It is a magnificent building, rudely but solidly constructed in small square stone-work of the first century. But at present a cart-road runs from door to door, through the centre of the arena; the interior serves as a sort of supplementary farmyard; wagons and ploughs occupy the arched passages beneath the broken tiers; and the litter of cattle and horses fills up or renders impassable the vaults in many places. The mania for restoration, on the other hand, has taken the place of rational cleansing. Several of the round Roman arches have been rebuilt in modern stone-work, whose fresh and brand-new trimness does not add to the effect of the mouldering masonry at its side. Altogether, the appearance of the whole Amphitheatre cannot be considered as creditable to French archæologists, as regards alike their acts of commission and of omission.

The ancient walls possess perhaps greater interest, but are hardly less neglected than the Amphitheatre. They enclose a space five times as great as the existing city. Indeed the Roman town must have been one of the first provincial importance. The capital of the Oxybian mountaineers, and afterwards one of the chief factories dependent upon the great Phocæan metropolis of Massalia, it became for a time, after the fall of its mother-city before Cæsar, the chief seaport of the province. Its name of Forum Julii shows the high position which the Dictator intended it should fill, in the place of unfaithful Marseilles. The massive and extensive ramparts which hemmed it in can still be distinctly traced round their whole circuit, through fields and gardens, while the shrunken modern town now occupies only a small hillock in their south-western corner. The Porte Dorée, the finest of the existing gates, also in masonry of the first century, cannot be closely approached, as it gives shelter in its present state to a few pigs and fowls, and has been closed from public access by a rough wooden door. Like the Amphitheatre, however, it has fallen into the evil hands of the restorer, and has suffered almost as much from excessive affection as from careless neglect. Three or four other gates of less importance, but equally encumbered, are found in other places, and one has fallen a victim to the construction of the modern railway station. The entrance to the old port is marked by an octagonal tower, known as the Lanterne d' Auguste, which doubtless served the purpose of a pharos. The railway now runs on dry land through the midst of the silted harbor, begun by Caius Cæsar and completed under his nephew. It must once have covered a considerable space, since Augustus stationed here the two hundred galleys which he had captured at Actium. As late as the reign of Henry II, the port was still serviceable for purposes of war; but the rapid accumulation of alluvium at the mouth of the torrents has long completely severed it from the sea, and Fréjus has now sunk to the position of an essentially agricultural centre.

In the interior of the town, fragments of Roman work, more or less disguised, exist in profusion. Ruins of a small temple, with mixed stone and brick courses of the fourth century, occur in one of the least narrow alleys; and numerous smaller pieces can be noticed among the tortuous lanes by any visitor who chooses to pick his way with care through what the Laureate succinctly describes as "the poached filth that floods the middle street." But the glory of Roman Fréjus consists in its great aqueduct outside the town, one of those splendid works which watered the dry lowlands of Provence under the early Emperors as they have never yet been watered before or since. It is curious that even in our own day, when Frenchmen propose to irrigate the sandy flats of Sahara, the south of France itself is far drier and less fertile than under the rule of the Antonines. The Camargue, that great deltaic island of the Rhône, whose rich alluvial soil now lies barren over thousands of acres for want of irrigation, formed a waving sheet of corn in the days of Strabo, and earned for itself the name of the granary of Gaul. The valley of Arles and the neighboring plain of the Crau, covered by the vast mass of glacial boulders and pebbles which Zeus, according to the Phocæan legend, hurled down upon the enemies of Heracles, is now once more partly fertilized by the Canal de Craponne, which has but lately restored a semblance of life to the western edges of the stony waste. The Pont du Gard itself is only the chief existing survivor of a vast system of Imperial irrigation works. All along the dry southern coast little ruined aqueducts, like that at Vallauris, still attest the completeness of the Roman arrangement. Of this vast system the Fréjus canal formed a part. Taking its origin from the perpetual torrent of the Siagnolles, twenty miles from the town,

it runs across country alternately as a subterranean and an aerial channel, supported in places by single or double arcades, and often flanked by solid buttresses. The masonry belongs to the same type and date as that of the Amphitheatre, and the arches are seldom of equal or regular dimensions. They may be easily followed throughout their whole course. A fine mass, overgrown with ivy and maiden-hair ferns, still remains standing in picturesque ruin near the gates of the town.

Among mediæval monuments the most important is of course the Cathedral, upon which Fréjus may now be said almost entirely to subsist — at least in a social sense. Though much restored at various dates, it still forms a splendid and characteristic example of Provençal Romanesque architecture of the eleventh century. Its heavy and sombre exterior, almost entirely devoid of ornamentation, has yet a simple impressiveness of its own, by dint of sheer massive solidity. One sees in its strong and straightforward design some impress of that Roman decisiveness which so clearly marks the gates and buildings of the antique city. The interior is striking for its gloom and solemnity, for the vast size and simplicity of its supporting columns, and for the magnificence of its plain vaulted stone roof. Nothing more grand or more depressing can be imagined than the leaden appearance of its blue-gray arches. A few good monuments, some excellent wood-carvings, and a picture of the school of Giotto, regilded and repainted with somewhat obtrusive fidelity to its original tints, complete the chief internal attractions. A pair of magnificent oaken doors, however, is kept by the sacristan as a parting treat, and only uncovered by special request. The baptistery, said by local tradition to be adapted from a temple of Diana, and certainly of much earlier date than the main building, rests wholly upon eight fine monolithic granite pillars with white marble capitals, which might well have come down to us from the fourth century. Fragments of Roman fluted shafts are built into the walls of the tower and of the episcopal palace; and the cloisters contain a number of much later clustered columns, extremely light and graceful in design, most of which were unfortunately walled up by the destructives of the Revolution into a solid indistinguishable mass. It is much to be regretted that some of the restoring zeal expended upon the Amphitheatre and the Porte Dorée had not been turned aside to the more useful task of disinterring these buried treasures. To judge by the few samples still visible, the cloister when entire must have possessed a singular and very unusual type of beauty. A single touch which gives vivid reality to the history of Fréjus may be noted in all the *ex votos*. Every one of these rude and flimsy pictures, belonging to the kind so common in Italian and Provençal churches, shows the Madonna or the patron saint in the act of rescuing some distressed votary, and bears the date of place in the stereotyped form, "*In Foro Julii*." That form has doubtless come down in unbroken succession through popular tradition from the earliest age of the Church, and its natural occurrence on these naive pictures is a striking mark of that continuity with Roman thought and Roman manners which is perhaps more noticeable in Provence than even in Italy itself. Visigoths, Burgundians, Franks, and Arabs, each have come and gone again; but Fréjus still retains all but unaltered its Roman identity, its Roman tongue, its Romanized population, and its Roman title of Forum Julii. — *The Saturday Review.*

THE ILLUSTRATIONS.

THE NEW BUILDING FOR THE NATIONAL MUSEUM, WASHINGTON, D. C. MESSRS. CLUSS & SCHULZE, ARCHITECTS, WASHINGTON, D. C.

An abundance of most valuable material for the development of the resources of the nation, much of which dates from the gifts of foreign governments to the United States, and from the exhibit of the United States on the occasion of its Centennial International Exhibition, lying dormant and inaccessible to the public, an appropriation of $250,000 was made by Congress on March 4, 1879, for the erection of a fire-proof building for the National Museum, on the public grounds near the building of the Smithsonian Institution. The funds were to be expended under the control of the Board of Regents of the Smithsonian. The Regents created a building commission, of which Gen. Wm. T. Sherman, Dr. Parker, and Prof. S. F. Baird are the members. On invitation of this Board, Major-General M. C. Meigs consented to act as consulting engineer. On March 25th following, the commission placed the construction of the building in charge of Messrs. Cluss & Schulze, architects, the authors of the adopted designs, who are about to finish the building within the limit of the moderate amount placed at their disposal. The building will be ready to receive the cases and a steam-heating apparatus by the month of July next. For a description of the building we quote from the official report of the architects, under date of January 1, 1880. The building starts on the ground in the form of a square with sides of 327 feet, extreme length. This is surmounted by a dome and a cross. Within its façades, a net area of 102,200 square feet, or $2\frac{85}{100}$ acres is covered by roofs. From one of the cellars a subterranean communication with the adjacent Smithsonian building is established, which besides ordinary uses, will serve in cases of panic, fire, tumult, robbery, etc. On the main floor there are available, in 17 halls which freely communicate with one another, 80,300 square feet of floor-space, and a proportionate amount of wall-space for exhibition purposes. Further, there are available on the main floor and two upper stories of four corner pavilions and eight towers 27,400 square feet of floor-space, divided off into 135 rooms for administrative purposes, offices, working rooms, photographic studio, the necessary modern accommodations, etc. And finally about 4,000 square feet of floor-space in galleries which are intended in part for special collections, and in part to afford an unobstructed view of the *ensemble* of the exhibits. On the whole the one-story plan which has prevailed among experts ever since the Paris Exhibition of 1867, has been adopted; but by the introduction of upper stories in ornamental pavilions and towers, ample office room has been secured without encroaching materially upon the floor-space of the main halls. The centre of the building is octagonal on the ground floor, and is surmounted by a sixteen-sided polygon of 67 feet diameter, which contains a tier of large windows, and constitutes a dome-like structure with a slate roof and a lantern, crowned by a decorated finial. This dome is 77 feet high on the side-walls, or 108 feet to the top of the finial. Four naves of 65 feet in width, and 117 feet in length, radiate from the dome, and extend to the outside walls of the building; these naves form a Greek cross, over the centre of which the dome rises, and part of the spaces between the arms of the cross are fitted up with halls of 65 feet square, and of the same height as the naves. The side-walls of both being 42 feet high, while the height to the ridge of the slate roofs is 56 feet. These roofs are in part constructed double, for the purpose of so perfecting the drainage of the roofs that accumulations of ice and snow can nowhere obstruct it. The spaces between the high walls of and around the Greek cross on one side, and the exterior walls of the building on the other side, are allotted mainly to eight halls of reduced height, covered by lean-to metal roofs; the extreme height of which is 32 feet. By this treatment, wall-spaces are obtained for the introduction of clerestory windows, which light the square halls, and assist in lighting the naves. The four symmetrical exterior walls of the building are broken by projections in the centre and at the corners, and these have been amply utilized for miscellaneous administrative purposes, as stated above. A modernized Romanesque style of architecture was adopted for the new building in order to keep a relationship with the adjacent Smithsonian Building. The external architecture is based upon the general arrangement of the interior, it shows plainly the prominence of the four naves, and the careful management of the light for the central portion of the building. Four main entrances are in the centres of the façades between two lofty towers 86 feet in height; these act as buttresses for the naves. Between the towers, above and receding from the doorways, there are large arched windows set with ornamented glass, and above these the gables of the naves are formed; they contain inscription plates, and are crowned by allegorical groups of statuary. The group over the northern gable designed by C. Buberl of New York, already in position, introduces Columbia as the protectress of science and industry. The second group by the same artist, the model of which is finished, represents Peace, with the fine arts. On both sides of these prominent central features there are curtain walls. In the rear of the curtain walls, the clerestory rises to the full height of the naves, the roofs of which terminate against the side-walls of the dome. The dome is treated in a similar way and strictly in the same character as the curtain walls above alluded to. In addition to the windows in the solid masonry of exterior walls, clerestory and dome, lanterns have been provided above the centres of the naves and square halls, so as to afford light for this enormous space without resorting to flat skylights. All the masonry above ground is composed of brickwork, built hollow, for outside walls, ornamented and laid in black mortar for the facing of exterior walls. To neutralize the monotony and commonplace appearance which could not have been avoided with red-brick fronts of such extent, a sufficient quantity of buff bricks has been introduced in panels and spandrils, interspersed with a small number of blue bricks in the ornamental work of brick-cornices. A base course of granite extends all around the building. The wrought work of the main entrances, window-sills, inscription plates, copings, etc., is of cut gray Ohio freestone. Anything else in the line of decoration is executed in substantial metal-work. The floor-beams, girders, and roofs consist, or are constructed, of rolled and shaped iron. The floors are fire-proofed by brick arches and concrete. Of roofs there are no less than thirty-seven, many of them of most complicated construction. The lanterns on the ridges of the naves are large enough to cover moderate-sized dwellings. The light but solid frame-work of all the roofs will be left in full view, painted in light neutral tints. The covering of the metal roofs is laid upon fire-proofed gratings, suggested by Gen. M. C. Meigs. The slates are hung to iron purlins in order to facilitate the heating of this building; the sashes all through the building are glazed with two glasses for each pane, having an intermediate air-space. In all windows facing the halls, the outer pane consists of obscured glass in order to obtain a mellow light and to avoid the necessity of shades. The floors of the main halls will consist of concrete, but the rooms and smaller halls will be floored with Florida pine laid on concrete. The interior is being plastered in sand finish, washed in tints. The wide main entrance doors of walnut and oak, open outward on spacious tiled vestibules, with sides and arched ceilings of ornamented buff brickwork. These vestibules are closed after hours by wide double wrought-iron gates, richly ornamented, and finished in bronze and gold. The northern entrance is intended for general use, and hence it was given due prominence. A spacious tiled platform bounded by granite side-blocks in front of this entrance is approached by broad granite steps; these

are flanked by candelabras. The completion of this building in which are enclosed 3½ million cubic feet of space above the cellars, required more than 5½ millions of bricks, 3,250 cubic yards of rubble work and concrete, 500 tons of iron, and 31,000 square feet of glass.

AN ORIEL. MR. R. M. HUNT, ARCHITECT, NEW YORK, N. Y.

AN EXPERIMENT IN ACOUSTICS.

A week or two ago an interesting acoustical experiment took place in the premises of Mr. A. C. Engert, of the City-road, London, the object of which was to show how sound may be propagated and improved by the use of steel plates and wires. With all our practical science and architectural progress, it seems almost impossible for our best architects to design a hall or a concert-room that is fairly perfect as regards sound; even those who have set themselves to solve the problem, unhampered by other necessities, have failed in the attempt, as that great failure, in so many respects, the Albert Hall itself, affords proof. The old adage is exemplified in this as in many other matters, that an ounce of fact is worth a ton of theory. Mr. Engert has been a student of the subject for forty years, and he seems to have tested every step by experiment. Those who visited the late Building Exhibition at the Agricultural Hall at Islington may remember the stall which this gentleman had fitted up, in which was placed a piano, having several steel plates hung behind it for the purpose of showing how the notes of the instrument were increased in volume and richness. Many who had the curiosity to enter the stall expressed some doubt about the matter, till it was clearly proved to them that the plates did really magnify the sound, and that the instrument played without their assistance was wanting in tone and richness. But this experiment was hardly practical in its results. People did not care to order a lot of rough steel-plates straight off, to hang behind their costly drawing-room pianofortes. Since then, Mr. Engert has been busily engaged perfecting his theory, and he now has introduced an improvement in the shape of steel wires, which are less unsightly, and can be applied to rooms of all shapes. By the use of the plates or wires, artificial resonance is obtained, and further, every sound becomes fuller and richer; the speaker finds he can use less voice to produce the same effect, and his efforts to make himself heard, being reduced, are rendered less harsh.

Now, architects usually endeavor to obtain this desirable result in a concert or lecture hall by using linings of wood, sounding-boards, and reflectors; and pine wood is known to be a valuable material for this purpose, as sound travels in it four times quicker than in air; but unfortunately, a well-filled public room neutralizes the effect, for every individual becomes a damper, and deadens the sound. There are also, the disturbing elements of architectural effect, breaks, recesses, columns, timber-roofs, etc., to contend against, which cause return-waves of sound to follow one another at different intervals, according to the distance and angle of the obstruction, and thus confusion of sound is the result. By the judicious use of drapery the after-sound-waves may be prevented or deadened; for it must be remembered the secret of causing sound to be heard clearly and distinctly is to prevent the repetition of sound-waves from different distances, so that, in fact, the return-waves should reach in a due time the original sound, and combine with it and reinforce it as it were. Only by securing this simultaneous return of the sound-waves can distinctness be obtained.

Mr. Engert's first experiment was quite conclusive as to the value of steel plates in producing resonance. In a room about 18 feet square a piano was placed, behind which were hung or fastened a number of vibrating steel plates, of guages from 20 to 28, so placed that the sound-waves might act freely between the plates. To assist this, the plates are curved a little, and they are also fastened together by spiral steel springs. At their lower end they hang quite free, so that they take up any vibration in the air produced by a note. The wave thus confined between the plates, and repelled a large number of times, creates a repetition of the sound, or a combination of these repetitions are produced, adding to the volume and richness of the original note. Proof of the value of the steel plates was afforded when a young lady (Miss Rolfe, a daughter of Mr. Engert's partner) played an air on the piano, and also when her sister accompanied her in singing. Though the instrument was rapidly played, each note was distinctly heard; the steel plates, in fact, absorb the vibrations, and respond to the same sound. The thicker plates, as may be expected, favor the higher notes, and the thinner ones the lower notes.

The second experiment was made to show the effect of steel wires in distributing the sound. Those who were present accompanied the inventor to a large factory, where eight wires were stretched longitudinally at a height of 8 or 9 feet from the floor. These were tightened to a certain tension by screws at one end, and fixed to hooks at the other end; across the wires were others, connected by spiral springs, while vertical wires, fixed to the floor, were passed through a space left open by the removal of one of the floor boards. These wires were behind the pianoforte, which stood near one end of the room of rectangular shape. After the audience had been distributed in different parts of the room, Mr. Engert made a few remarks, which were distinctly audible to every one. He next showed the effect of his speaking when his listeners were in an adjoining part of the factory without wires and afterwards the experiment was repeated, the visitors going upon the floor above, where four wires were longitudinally fixed in connection with the upright ones, which we have before described. The speaker remained below, and his remarks were distinctly heard above when the listeners stood between and below the wires, but at other parts of the loft he was inaudible. It may be explained thus: the wires absorb the vibrations of the voice, and convey it from one to another, by which means every word is distributed over the room with clearness. No after-sound was audible, as the waves are broken by the wires, which take up the notes, and give them out again in every direction. The effect of the wires is to increase the speed of sound, to spread it over a larger space, and prevent the return of vibrations. For this purpose the wires must be tuned to the room, so as to enable them to take up the vibrations readily, and convey them. The inventor does not claim to magnify the sound by these means, but to convey and spread it with distinctness, and to prevent any echo or confusion that may exist in the room. The wires, of different gauges according to their length, are placed 2 or 3 feet apart, and one or more layers of them, all connected, may be fixed at certain heights, which are regulated by experiment. The lower they are, the better effect they are said to produce. In a church, a height of 15 feet may be taken. The experiments were enlivened by some music and songs, every note of which was rendered distinct by the arrangement, so that one could enjoy music in any part of a large room, no matter at what distance from the instrument. It must be remarked that Mr. Engert's system is not the plan that has so often been advocated in our paper to prevent echo, which consists in fixing wires across the building. If the system cannot be regarded as original, the inventor deserves credit for being the first to apply wires for the distribution of sound in a building.

There are certain physical laws which Mr. Engert has taken into account in the improvements he has introduced, the most important of them being that law by which a string, when at rest, absorbs the particular undulation or musical note which it gives out when struck. It is well known that when a musical note is sounded in the presence of an instrument capable of sounding the same note, this instrument takes up the note and gives it out of its own accord. A piano or harp rings to the sound of another instrument which is touched, and in a like manner the strings or wires in Mr. Engert's apparatus absorb the vibrations of sound of the speaker or singer, and carry them off, preventing their return. The wires are tuned to the room, and their vibrations break the sound-waves, and destroy the surplus ones which so frequently create echo or confusion of sound. We may thus regard Mr. Engert's plan as the means of distributing the sound-waves more evenly, and preventing the after-sound, which is so destructive to voice and music in many of our public rooms. In air, sound travels 1,100 feet in a second, but in steel the speed is increased more than tenfold. One advantage of the system is its simplicity and readiness of application. It is not cumbersome, or unsightly; it need not interfere with the architectural arrangements; no artificial ceiling or resonant walls are required. Buildings of semi-circular shape and without the obstructions of columns and arches are rare; but the wires can be introduced in any room; indeed, the value of the method is the readiness with which it can be applied to buildings of imperfect construction. We understand that the cost would be trifling. An ordinary church would probably require the expenditure of from £50 to £100, to fit it up with wires. Mr. Engert's experiments were necessarily rather incomplete, and we should like to see them tried in a church or lecture-hall of confessedly bad character for sound. A committee of architects of the R. I. B. A. might well undertake the task of making a few experiments — there is no lack of suitable buildings to try them in. In the meantime the attention of architects individually may be directed to what seems a very useful remedy for imperfect acoustics in buildings. — *The Building News.*

COOLING.[1]

As opposed to methods of *heating*, it is desirable that something should be said in relation to methods of *cooling*, since in nearly every portion of this country it is more or less desirable to possess some means for keeping articles of food cold during hot weather, and for cooling beverages. Although a number of machines have been invented, by which ether or ammonia can be vaporized and thereby produce a freezing temperature, these apparatuses have been most serviceable in the artificial production of ice in tropical climates, in certain manufacturing processes, and in restaurants where masses of ice are formed in the interior of water-bottles used on the table.

In many hot countries a very simple method for cooling drinking-water has been employed for centuries. Water is put into a coarse, unglazed earthen vessel, and set in a draught of air in the shade, its mouth being closed to keep out warm air. As the water oozes slowly through the pores of the vessel, it is evaporated by the wind and cools the contents.

Sailors sometimes cool their drinking-water by placing it in a clean bottle, corking it tight, putting it into a woolen stocking, which is then wet and hung in the rigging out of the sun. As fast as the water evaporates from the stocking it is renewed, and after a time the contents of the bottle will have become refreshingly cool. Soldiers' canteens are sometimes covered with a thick jacket of felt to serve a similar purpose.

The cellar usually found under most houses, fulfils, in some measure,

[1] We have lost the record of the title of the book, published by Messrs. Wm. Wood & Co., New York, from which this excerpt is made.

the purpose of a cooling-room for articles of food; but when a furnace is placed in it to warm the house above, by the radiation of heat the value of the cellar as a refrigerator, even in winter, is quite destroyed. It is necessary for the preservation of food that the air about it should be dry as well as cool, and free from organic matter; but very many cellars are damp, the air in them contains effluvia from rotting fruit and vegetables, decomposing vermin, the urine and fæces of the family cat, rancid grease, the soap-barrel, decaying wood, spilled milk and cider, etc., etc. And it may be that the air of the cellar is further contaminated with ground-air from the neighborhood of an adjoining cesspool; while there is rarely any provision for the introduction of fresh air or the escape of that which is foul.

Another method sometimes resorted to for keeping small articles of food cool is to lower them by means of a cord into a deep well until they nearly reach the water.

In comparatively few instances do we find among farmers and the dwellers in villages any attempt to make use of ice or snow which has been stored during cold weather to be used when summer arrives, although the expense of securing and keeping such a supply is trifling compared with the benefit which results from having it. It is the want of a cold room which prevents many of the persons referred to from having fresh meat on their tables as often as their circumstances would otherwise permit; and whoever has passed any time in a small country-village has had occasion to notice the tough and unsavory quality of the meats procured from the butcher's wagon at its periodical visit, as compared with the juicy roasts, steaks, and chops to be had of a city butcher. The secret of this is not so often in the quality of the meat as in the fact that the country butcher sells his meat as soon as possible after it is slaughtered — usually on the following day; while the city butcher, who has a regard for his reputation, will not sell his beef until it has been killed at least a week. To accomplish this in warm weather he provides himself with an ice-room in which the temperature is so low that putrefaction does not take place.

There are many dishes and beverages suitable for warm weather for which a farmer's wife has the materials at hand, but which require a low temperature for their preparation. Perhaps there is no time when ice is so desirable as during the progress of some of the fevers to which rural districts are so liable, and the possession of a supply may then become almost invaluable.

Certain things are requisite in preserving ice during warm weather. It must be protected from air, and it must be kept dry. The simplest way to accomplish these is to raise a platform of earth above the level of the surrounding soil, being careful that it slopes from the centre to the edges. On this place a layer of sticks; on the sticks arrange a bed of straw or saw-dust, and on this pile the ice closely. Cover the ice with more saw-dust or straw; on this lay sticks, and over all make a bank of earth and sow it with grass, or cover it with hay or straw. A bank of this character may be made long and narrow, and opened from one end as fast as the ice is consumed. It is more customary in this country to build a house or shanty with hollow walls filled with saw-dust, planing-mill shavings, finely chopped straw, chaff, charcoal, or ashes. The fine coal which collects in enormous heaps about coal-mines is said to make an excellent filling.

In choosing a site for an ice-house, gravelly and sandy soils are the the best and clay is the worst; a side hill by which a part of the room can be surrounded economizes lumber, furnishes earth for banking up the wall, and enables the wagon or sled on which the ice is hauled to the house to come nearly on a level with the upper part of the door, and thus saves labor in stowing. The floor of an ice-house should have a decided and even slope toward one corner, where a trapped drain-pipe may take to a distance the water which accumulates, or where a pit may be made large enough to hold a couple of wagon-loads of stones and form a drain.

It is best to have the door of access on the north side, and it is of great service to shelter the house from the sun by means of trees and creepers. The outside of the house should be whitened with lime-wash or paint. When a foot or a foot-and-a-half in thickness of saw-dust, shavings, or finely chopped straw intervenes between the sides of the house and the ice, an inner sheathing of boards is not essential, but the filling will require to be well packed as the ice is stowed. In all cases a covering equally thick, of the same material, should be spread over the ice. An inner sheathing of boards is of service in keeping the saw-dust or other filling in its place while the ice is being stored and also when the supply has been considerably reduced. When the wall of an ice-house is made of brick or stone it should always have an inner sheathing of boards.

The roof should have broad eaves to throw rain away from the foundation, and for a similar purpose earth should be banked well up about the walls. A space should be left under the eaves on both sides to admit a free passage of air through the house; otherwise the air, if confined, becomes warm from the action of the sun on the roof, and the ice will quickly melt.

Unless a small cold room is made in one corner of the house, with a vestibule and double or triple doors to cut off the access of warm air from without, it is better, in warm weather, to open the house only very early in the morning or toward dark in the evenings, when a supply of ice can be transferred to an ice-box. A cold room connected with an ice-house is very often of great service in preserving meat, fruit, milk, etc., and but little ingenuity will be required to arrange it so as to be sufficiently commodious without encroaching very considerably upon the capacity of the ice-room.

There is a method of constructing "ice-wells," as they are called, in places where a structure above ground would be unsightly, or where the expense of a building is sought to be avoided. For the first reason, they are quite commonly found at sea-side resorts. A tapering pit being dug and a drain constructed to carry water away from its funnel-shaped bottom, a sheathing of boards is put in, having a space of eight to twelve inches between it and the ground. Into this space saw-dust is tightly rammed. A sloping roof is added, through the apex of which a curb is so fixed that the well can be easily filled. After the ice has been securely packed, a trap-door is put into place, and the curb is packed with saw-dust and earth. The roof is also covered with a layer of saw-dust, and outside of this the earth removed from the well is closely packed and its surface sodded. The entrance should be closed by two doors, and, as an additional protection, bundles of straw may be packed against the inner one.

Mr. William Eassie, of England, in his little work on "Healthy Houses," gives a number of illustrations of different methods for constructing ice-houses and ice-wells, and appends the following practical directions:

"When filling the ice-well, stow away the first ice of the season, taking care that it is free from dirt, and, above all, from snow. In stowing it in the well, avoid mixing it with straw, as this will render it very porous. Choose also as clear a day as possible upon which to cart home the ice; and when dealing with pond-ice, break up the cakes with a mallet to a coarse powder and ram it well down, throwing a little water upon it occasionally to facilitate congelation. Some sprinkle the ice with salt and water, one pound of the former to one gallon of the latter, out of a watering-pot, at intervals of two feet up to the top, pouring on an extra quantity when the well is filled up. This cold-water treatment makes the ice so solid that it will yield to a pick-axe only, and an ice-well should always be built sufficiently wide and shallow to admit a man with such an instrument."

Ice-boxes for constant use need only to be made of two ordinary packing-boxes with their covers, one box being sufficiently larger than the other to leave a space of three inches between their sides in all directions when the small one is placed inside of the large one. This space should be filled with finely powdered charcoal closely packed. A tube should pass downward from the bottom of the inner box to carry off water, and this tube should be bent up at its end so as to make a water-valve and prevent access of air. It is desirable, also, to line the interior of the inner box with zinc to prevent its walls from becoming foul and to enable it to be kept clean.

There are many localities where ice does not form on most bodies of water, but nevertheless where there are frosts during the cold season of the year. In these places the collection of ice may be accomplished by exposing water in shallow vats protected from wind and open to the sky, so as to permit evaporation. On a clear night a coating of ice will often form under these circumstances if the water is kept free from motion.

To produce cold with the aid of other means than ice alone, a great variety of compounds may be employed, and may serve certain special purposes or in emergencies.

A SLATE COVERED ICE-HOUSE.

New York, Oct. 12, 1880.

To the Editor of the American Architect: —

Sir, — The experience with the above structure, as stated in your last issue by a correspondent, that ice keeps better under the slate roof, than in his two other wooden ice-houses, is not as phenomenal as it may have appeared to the gentleman, and, making some allowance for the probability that all other things were not exactly equal, is best explained by reference to his further remarks:

"Between each bracket under the cornice is an opening for ventilation, *especially for the ice*," and, "the building is exposed to the sun's rays all day long, and the ice-box is only a cube $9 \times 9 \times 9$ feet."

Slate is a good conductor, and a three-inch thick layer of it will transmit about as much heat in a given time, as a *one*-inch thickness of hemlock or spruce board.

The sun's rays come to us hottest an hour or two after noon, and their heat in summer — at least 15 degrees Fah. above the shade temperature — has by this time penetrated a thin roof, and then bears on the ice-box about as much as if the latter were under no shelter at all.

As the sun goes down, the heat *on* the roof cools off some 15 degrees, and the same heat *under* the roof is supposed to escape rapidly through the ventilators "between each bracket under the cornice," or at any other aperture which may have been provided. Of course it takes time, before this natural ventilation is thoroughly accomplished, as is well known to the unfortunates who sleep, or try to sleep, after a hot day in the attic of a country or city house, or even in the most magnificent sea-side hotels, in which the protection against heat is limited to a one-inch roofing-plank and less than one-inch thickness of lath and plaster ceiling; the air-space between the two only acting as a reservoir of heat for the night's enjoyment. The slowness of this equalization of temperature by means of ventilation is best observed in any dwelling of ordinary construction after a summer thunder-storm: the windows being opened, cool breezes enter the rooms, but about half an hour later — if it be still cool outside — the room temperature warms up considerably in spite of open windows; cause: the day's heat which is gradually coming out of the walls and floors.

So in the ice-house: the slate roof cools quicker than the wood roof, and consequently *diminishes* the heat under the roof more quickly than the latter, not by ventilation but by contact cooling, and though the heat transmitted during the morning is more quickly accumulated under the slate roof, the *maximum* heat in the afternoon and evening is held longer under the wood roof and therefore works more injury to the ice-box. This is not an argument in favor of slate roofs for ice-houses, but certainly conclusive as to the deduction, that ventilation and air-spaces are only provided especially — though unintentionally — for *melting ice rapidly*. This old system of building roofs which let the heat *through* and then applying means to let it out again, is about as rational as if a brake were applied to the hub instead of to the tire of a wheel, and it is rather remarkable, that Count Rumford's air-space theory should be nowhere more misapplied than in American house-building. I, of course, refer only to the usual flimsy structures with air-spaces under roofs, between floors and in partition-walls, the air-spaces in walls being confined by just sufficient lath and plaster to produce visible dampness on walls, etc., at every marked change of the atmosphere, and in consequence a rapid decay of the structure.

As your correspondent styles himself an "amateur," I may be permitted to be somewhat "pedantic," as it must appear to your "professional" readers, who, of course know all this better than I, and who may have weighty reasons for frequently not putting into practice that which they esteem as correct.

To preserve ice: deafen roof and walls with one-foot thickness of sawdust filling, or an equivalent lining of other insulating material. Pile the ice as high up to the roof and as close to the walls as possible; avoid all air-spaces, and as far as practicable, leave no air in or out of the compartment, unless the outside temperature is below the freezing point. A twelve-inch sawdust lining is amply sufficient to keep out the direct sun-heat, which, being transient, can do no harm, because only that part of it which penetrates during the day beyond the middle or centre of the filling will go into the ice-house, whereas the heat which has only worked itself into the outer half of a wall, will radiate back at night.

In spite of all precautions and safeguards ice will melt, and how much of it will be lost even in comparatively cool weather is best shown by an example borrowed from Peclét:

An ice-box stuffed on all sides with cut straw — twenty inches thick — and representing a cube $10 \times 10 \times 10$ feet, exposed on all sides evenly to the air, filled with ice on the first of January, and kept closed until the first of May, the mean temperature during these one hundred and twenty days and nights being assumed to average 43 degrees Fah., (as in Paris) would lose in this time about 20 per cent of its ice!

By allowing for a ten-foot cube a lining of only one foot thickness, the ice-body would be $8 \times 8 \times 8$ equals 512 cubic feet; or at 50 pounds per cubic foot of stowed ice equals 25,600 pounds, the 20 per cent loss equals 5,120 pounds, or over 8½ pounds of ice melted per square foot of surface, the total surface being 600 square feet. Were the surface area of the box twice as large, or the walls or linings half as thick as stated, nearly double the loss would have resulted from the same quantity of ice, or the loss would *decrease* in proportion to the increase of contents over that of surface area.

This is the theory, roughly outlined. In order to adapt it to practice it has to be considered that Peclét assumes his ice-box to be exposed on all sides to a constant influx of 43 degrees Fah., on ice at 32 degrees Fah., whereas opened doors during a cold snap, as well as absolute seclusion from the effects of the sun's rays and the rapid changes of the weather, play an important part in reducing the theoretical loss.

If, for instance, the temperature were constant for several days and nights at say only 35 degrees Fah., *some* ice would probably melt in the best ice-house, whereas, if the thermometer ranged every day for a few hours up to 75 degrees Fah., or even higher, but then receded always below the freezing point, then no ice would melt. In the same manner a temporarily very low temperature could not compensate for a subsequent lasting excess of heat.

Respectfully, A. D. Elbers.

THE COMPETITION IN INTERIOR DECORATION.

Washington, D. C., Oct. 14, 1880.

Messrs. Editors, — Could you inform me if there is any special manner to prepare drawings for reproduction, or will simply using India-ink on Whatman's white paper answer as well? Also, will it be allowed to make several perspectives on one sheet, or must one fill the entire sheet, 14 by 22 inches? and will the drawings be returned after awarding the prizes, provided the designer pays express? An answer will greatly oblige T. C.

[To "T. C." and similar questioners we will say, that it is the intention that a single perspective drawing of the entrance-hall of the hotel shall occupy the whole of one sheet 14 inches by 22. It is, however, allowable to render the details which are to fill the second sheet, either in perspective or in elevation, as the designer chooses.

All drawings, except the prize drawings, will be returned to their authors in due course.

The following advice as to the manner of preparing the drawings will cover the points sugge-ted by the first question:

Only pen-and-ink drawings, without brush-work of any kind, are desired. The most satisfactory results are obtained from drawings made upon Bristol board or hot-pressed Whatman.

Tinted paper should not be used.

As it is possible that an accident might happen to a nearly finished drawing, a tracing of it on the dull side of tracing-cloth, on bank-note paper, or on ordinary tracing-paper, provided it have not a yellowish tinge, will be accepted.

The ink used should be India-ink, in which a little ivory black has been rubbed, to insure perfect blackness of line.

The lines should be firm, sharp, not too coarse, and not unintentionally broken.

Shading and hatching lines should not be too close and crowded, especially when a large surface is to be covered.

Eds. American Architect.]

NOTES AND CLIPPINGS.

Metropolitan Museum of Art, New York. — The number of visitors from April 1, to September 30, was 779,402.

London Architecture. — A survey of the buildings of, say, London, remarks the *Saturday Review*, demonstrates first, that renowned architects do not always know style, proportion, picturesqueness, good building or sculpture; and second, that some of the best buildings were designed by amateurs.

Memorial Stones in Cambridge, Mass. — Index stones, four feet high by two and a half feet wide, are to be erected by the authorities of Cambridge, Mass., on the spot where four citizens were murdered by British troops retreating from Lexington; on the site of Putnam's headquarters; at the mansion of the poet Longfellow, formerly the headquarters of Washington; on the spot where once stood the home of Thomas Danforth; on the site of the house of Thomas Dudley, one of the founders of the city; and at the place where was built the first meeting-house in Cambridge. A tablet will also be placed at the corner of Otis and Fourth streets, with the following inscription: — "Site of Fort Putnam, erected by the American forces, December, 1775, during the siege of Boston."

Dry Rot in Houses. — At the annual meeting of the Cryptogamic Society of Scotland, commenced in Glasgow on Monday evening, a paper by Mr. Young, architect, of Perth, was read by the secretary, Dr. Buchanan White, on "Dry Rot Fungus in Houses, and the best Means of Eradicating it." The following were the conclusions at which Mr. Young arrived: — 1. That wood is necessary for the root or first production of the fungus. 2. That the wood after a time gets exhausted of its nourishment for the fungus, and when this is the case the plant attached to it dies. 3. That if it has wood for its root its branches will luxuriate, where there is no wood, even in the heart of a well-built dry rubble wall; but when the wood at the root is exhausted it dies in the wall. 4. That where the conditions are favorable free ventilation is not against its growth; on the contrary, a draught aids it in dispersing its spores. 5. The cure is to eradicate it as far as possible by burning the soil, applying a flame to the walls, and removing every particle of wood from its locality, and substituting stone, iron, or cement. 6. That upon perfectly dry and healthy wood it would not readily take root, but if it gets good root in dampish wood its growth will ramify over dry fresh wood and prey upon and destroy its tissues, thus ruining it for all structural purposes.

A Monument to Titian in his Birth-place. — In Pieve di Cadore, a small town of the Italian province Belluno, situated near the Austrian frontier, there was dedicated last month a monument to Titian Vecellio, — who was born there in 1477. This memorial has been erected to the honor of their celebrated countryman by the dwellers in the valley of the Pieve river, which flows southward to reach the Adriatic sea close to Venice. The design of the bronze statue was by the painter Ghedina; the execution was entrusted to the Venetian sculptor Dal Zoto; the work has been carried out with considerable skill, but it makes upon the whole no imposing effect. Upon one of the eight sides of the pedestal is the simple but expressive inscription "A Tiziano il Cadore," upon the others the chief works of the artist are named in letters of bronze. The figure is more than life size, in the traditional costume; hose, under-vest, and the long cloth coat (*Zimarra*) falling in many folds; one hand holds the palette, the other the brush. Some admirers of Titian have taken this opportunity to publish a pamphlet giving a number of newly discovered documents which bear upon his origin and the circumstances of his life; it includes seven of the painter's letters. The enthusiastic local celebration, taking place in the beautiful days of a Friulian September, upon the very slopes of the Carnic Alps, attracted numbers of visitors and is said to have been peculiarly impressive.

Delos. — We have further interesting information from Delos concerning the excavations undertaken by the French archæological Ecole d'Athènes under the direction of M. Homolle. This work has been noticed in a letter written from the site by Mr Clarke during the summer of last year, printed in the *American Architect* for August 30, 1879. Among other things a house has recently been discovered, which, in architectural style and internal arrangement, is quite similar to those of Pompeii. This is of great importance in view of the fact that our knowledge of the purely Greek house has hitherto been almost entirely derived from the casual mentions of ancient author. The modern Athenian press calls upon the Grecian Archæological Society to take the matter into their own hands and to institute wider and more minute explorations upon this celebrated island. Still it may be feared that, in the present political restlessness of Greece, any intervention, prompted as this is by weak, national vanity, would be only pursued in the usual desultory manner and would result in hindrance to the wiser and better-disciplined work of the French, which has been hitherto thoroughly and steadily, if slowly, carried on. After the Government's careless and unworthy treatment of the treasures already discovered, and the isolation of these upon the neighboring island of Mykoni, there now appears danger that the foreigners upon Delos may be excluded from the investigations, — merely to gratify the provincial selfishness of modern Greeks.

BUILDING INTELLIGENCE.

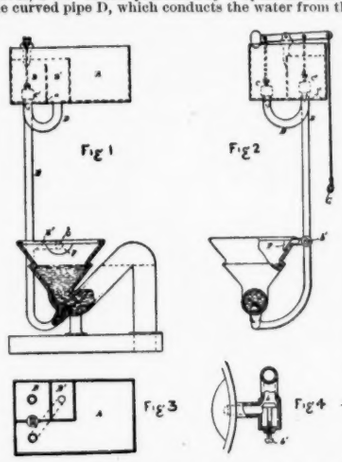
[Reported for The American Architect and Building News].

[*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.

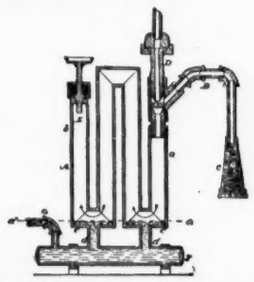
[*Printed specifications of any patents here mentioned, together with full detail illustrations, may be obtained of the Commissioner of Patents, at Washington, for twenty-five cents.*]

231,687. TANK AND FLUSHING CONNECTION FOR WATER-CLOSETS. — William Smith, San Francisco, Cal. The object of this invention is to provide a self-operating and self-emptying closet. A is the water-tank, which is subdivided into compartments, B B′, the two compartments being connected by a hole, *a*, at the foot of the partition which divides the two, and this partition is less in height than that which surrounds the compartments, and both partitions are less in height than that of the sides of the tank A, so that water may flow over the top into these compartments, if desired; yet in operation the water will usually pass from the compartment B into B′ through the hole *a* at the bottom of the partition. The partition which divides the compartments supports a split post, on which is placed a weighted lever, which carries two valves, C C′. That represented by C opens and closes the curved pipe D, which conducts the water from the



tank A into the compartment B′, beneath the tank, and that at C′ opens and closes the pipe E in the compartment B, which leads down to the basin beneath. From E extends a branch-pipe, E′, having a valve, *b*, which is operated by a set-screw, *b′*. The branch-pipe opens on a semi-circular water-spreader, F. The pipe continues down to the emptying-jet, the office of which is to expel the contents of the basin over the siphon into the soil-pipe. The branch-pipe E′ is also made use of as a vent for the air within the pipe E, as the charge is about to pass down. The valve *b* regulates the quantity of water to wash the basin without excess. The after-wash from the small compartment B′ then finds its way down to the siphon, by the pipe E, through the small aperture *a*, and, not being of sufficient volume to fill the area of the pipe, it does not act on the jet with sufficient force to go over into the soil-pipe, but remains and fills the basin and siphon, to prevent the return of effluvia from the sewer. The operation will be as follows: the compartments B and B′ being empty, and the weighted lever being raised by the pull G, or the seat of the closet when the closet is to be self-operating, will permit the water in the tank A to pass down the curved pipe D, and up into the compartment B, and from thence through the hole *a* into the compartment B′, filling both compartments. Upon releasing the pull or seat the water passes down the pipe E, into the jet at the foot of the siphon, and forces the contents over the siphon and into the sewer, and at the same time supplies the spreader, F, so as to wash all of the upper portion of the basin. The air in the main pipe E will be forced down and pass through the spreader in advance of the stream of water. At the same time the jet at the bottom will empty the contents of the basin. The water will continue to flow with force so long as the compartments B and B′ are full; but as the contents become lessened the force will be lessened, and the trickling or dripping down the main pipe by means of the reserve in the compartment B is gradual, and fills the basin with water, as shown. Or, if the water be permitted to flow with its initial force, as in the case of its being taken directly from one compartment or reservoir in the ordinary way, it would be carried up or forced over the bend in the siphon to the soil-pipe, and if the suply be shut off suddenly, there would be no water left in the basin, in which case gas from the sewer would be permitted to escape in the building.

232,235. RADIATOR. — Jacob Brosius, Belleville, Ill. This invention consists of a steam radiator adapted to heat an apartment and remove impure air from it. A represents a series of pipes connected by bends, and forming a circuitous passage. To the inlet-pipe, *a*, is connected a jointed pipe, B, whose end is provided with a funnel, C, and to this inlet-pipe is also connected a steam-pipe, D, the pipes *a* and B forming a siphon, and the inner end of D projecting into *a*, adjacent to the connection of the pipe B, so as to act after the manner of an injector. The terminal pipe, *b*, of the series of pipes, has an outward-opening valve, E, which is weighted so as to permit the escape of steam at a given pressure. To the bottom bends, *c c*, are secured branches, *d*, which form communications between the pipes and a condenser or condensing chamber, F, which has an outlet pipe, G, the level of which is at a point between the bottom of the main lengths of the pipes, A, and the top of the condenser, so that the water of condensation will fill the con-



denser F, and branches *d* and portions of the bottom bends, *c*, of the pipes to the level — say *a a* — before escaping through the pipe, G, and will maintain this level, thus preserving the free communication of the bottom of the pipes, as shown by the arrows, and preventing the entrance and discharge of the steam into and through the condenser. Steam is admitted into the pipes A through D, so as to heat the apartment, as is evident, and impure air is drawn through the funnel C and pipe B into the pipes A, whereby it mingles and condenses with the steam, thus in a measure acting as a ventilator. When the steam is at or above a predetermined pressure, it opens the valve E, and escapes into the apartment, so as to moisten the air in it. The water of condensation enters the condenser, F, through *d*, and continually escapes by means of the outlet, G, without, however, permitting the escape of steam. The funnel, C, is packed with hair, felt, or other suitable material for preventing the noise of the indraft of air, and the valve, E, is also packed about with hair, felt, or other material, for preventing the escape of any water of condensation, without, however, preventing the escape of the steam, whether to moisten the air of the apartment or relieve an increased pressure in the pipes. Owing to the swivel-joints of the pipe, B, and of the funnel, C, the latter may have its mouth set in various positions relatively to the top, bottom, or sides of the apartment to be cleared of impure air.

233,072. APPARATUS FOR COOLING AIR. — Joseph Chellew, Glasford, Ill.

233,087. HOTEL ANNUNCIATOR. — James H. Giles, New York, N. Y.

233,090. STONE-DRESSING MACHINE.—Martin Greer, Bolivar, Mo.

233,104. SINK-TRAP. — Johan H. Langschmidt, Chicago, Ill.

233,113. STOVE-PIPE THIMBLE.—George E. Palmer, Dundee, N. Y.

233,145. WATER-CLOSET. — John Demarest, New York, N. Y.

233,203. COMBINED RULER AND PENCIL CASE.—Henry T. Cushman, North Bennington, Vt.

233,232. ELEVATOR. — Harry C. Goodrich, Worcester, Mass.

233,254. SASH-CORD GUIDE. — Wm. H. H. Kessler, Baltimore, Md.

233,269. THATCHED ROOFING. — Clark McClelland, Geneva, Iowa.

233,277. WEATHER-STRIP. — Amos Pratt, Geneva, Neb.

233,286. HYDRAULIC ELEVATOR. — James W. See, Hamilton, Ohio.

9,411. DISTEMPER PAINT. (*Reissue*). — Christopher G. Dodge, Jr., Philadelphia, Penn.

SUMMARY OF THE WEEK.

Baltimore.

BUILDING PERMITS.—The following building permits have been issued since the last report:

John C. Eardon 3 two-st'y brick buildings on McKim St., between Neighbor and Willow Sts.

James Turner, 3 three-st'y brick buildings on Madison Ave., between Lawrence and Roberts Sts., 22′ x 75′ each.

Louis C. Smith, 1 three-st'y brick building on Charles St., near Fort Ave.

J. L. Donaldson, 1 three st'y brick building, southeast cor. St. Paul and John Sts.

BUSINESS has been so totally suspended for the past two weeks on account of the Sesqui-Centennial Celebration, that your reporter has been unable to gather sufficient items to make up a report.

Boston.

BUILDING PERMITS. — *Wood. — Colwell Ave.*, cor. Chestnut Hill Ave., for Wm. Colwell, 3 dwells., 23′ x 28′; Wm. L. Marks, builder.

North Beacon St., near Lyman Ave., for Geo. W. Hollis, stable, 46′ x 46′; Stephen Holmes, builder.

Neponset Ave., near Minot St., for John J. Williams, church, 49′ x 64′; Beal & Spear, builders.

Corey St., near Walnut Ave., for Mrs. L. A. Bailey, stable, 25′ x 42′; builder, Geo. A. Spear.

HOUSES. — Messrs. Allen & Kenway, of Boston, are the architects of a house for Mr. Miles Washburn, on Beacon St. It is to be a three-st'y brick and stone building, measuring 20′ x 65′.

A house is being built for Mr. Wm. Matthews, Jr., on Commonwealth Ave. It is a freestone front, 26′ x 70′, three stories high; Messrs. Hewitt & Webster are the contractors; Messrs. Allen & Kenway, of Boston, architects.

Brooklyn.

BUILDING PERMITS. — *Broadway*, cor. Fayette St., three-st'y brick tenement, 25′ x 28′; owner, Mrs. Weber, on premises; architect, A. Herbert; builder, Valentine Bruckhauser.

Atlantic Ave., No. 1070, four-st'y brick tenement, 23′ 6″ x 50′; cost, $3,000; owner, Mary Foley, 1065 Pacific St.; architect, Chas. G. Reynolds; builder, M. T. Reynolds.

State St., three-st'y brown-stone dwell., 15′ x 50′; cost, $5,500; owner, Florian Grosjean, Woodhaven, L. I.; architect, Charles Werner; builders, Litchfield & Dickinson.

India St., three-st'y brick tenement, 25′ x 40′; cost, $4,600; owner, Mrs. C. Wolfe, on premises; architect, Jas. Mulhaul; builder, Jas. Rooney and John Fallon.

Oakland St., three-st'y frame tenement, 25′ x 36′; cost, $3,000; owner, Jos. Meigh; architect, Fred. Weber; builders, Walling & Fenwick.

Broadway, 2 four-st'y brick stores and tenements, 22′ x 45′; cost, $8,000 each; owner, Wm. Dick, cor. South Ninth and Fifth Sts.; architect, W. H. Gaylor; builders, Jas. Rodwell and B. Gallagher.

Fifth Ave., 3 three-st'y brick stores and dwells., 20′ x 45′; cost, $3,000 each; owners, John Muir and Thomas Pittbladdo, 318 Twelfth St. and 213 Seventeenth St.; architect, G. Pittbladdo; builders, W. & T. Corrigan.

Humboldt St., 5 one-st'y frame greenhouses; total cost, $3,000; owner, J. J. Baumgart.

Prospect Pl., 2 three-st'y frame tenements, 19′ 6″ x 42′; cost, $2,400 each; owner, John Behrens, cor. Prospect Pl. and Rogers Ave.; architect, J. S. Sheridon; builders, P. Burns and Sheridan Bros.

Madison St., 2 three-st'y brown-stone dwells., 16′ 8″ x 40′; owner, Wm. H. H. Hollis, Lefferts Pl.; builder, E. B. Sturges.

Stockton St., three-st'y frame dwell., 25′ x 42′; owner, John Bopp, Ellery St., cor. Marcy Ave.; architect, John Platte; builder, Jno. Rueger.

Myrtle Ave., cor. Evergreen Ave., 2 two-st'y frame dwells., 12′ 6″ x 48′; owner, Edward Bridge, 306 State St.; architect, Chas. Edwards; builders, —— Teal and C. E. Edwards.

Caroll St., 2 three-st'y brown-stone dwells., 20′ x 45′; cost, each, $6,000; owner, E. L. Donnellon, 6 Jefferson Park; architect, R. Dixon; builder, P. J. Carlin.

Bergen St., 2 two-st'y brick stables, 30′ x 65′; cost, $6,700; owner, B. H. Adams; builders, Smith & Gibbons, and —— Brown.

Lynch St., 2 three-st'y frame tenements, 20′ x 40′; cost, each, $2,000; owner, John Jeffers; architect and builder, C. W. Wells.

Greene Ave., Nos. 527 *and* 527½, 2 two-st'y brown-stone dwells., 20′ x 44′; cost, $4,000 each; owner and builder, F. C. Vrooman, 444 Gates Ave.; architect, Fred De W. Vrooman.

Bedford Ave., 4 four-st'y brown-stone tenements, 20′ x 50′; owner, George W. Brown, 728 Fulton St.; architect, C. B. Sheldon; builders, Levi Brown and C. E. Cozzens.

Chicago.

BUILDING PERMITS. — D. W. Irwin, five-st'y brick store, 80′ x 166′, Wabash Ave. and Harrison St.; cost, $35,000.

M. Gottfried, three-st'y brick ice-house, 53′ x 100′, Archer Ave., cor. Stewart; cost, $18,000.

B. Schaeffer, two-st'y brick dwell., 25′ x 40′, 391 North State St.; cost, $2,500.

B. P. Hutchinson, five-st'y brick stores, 77′ 11″ x 80′ 6″, 15 to 19 La Salle St.; cost, $25,000.

J. Ehrmann, three-st'y brick store and dwell., 22′ x 76′, Twenty-Second St. and Hoyne Ave.; cost, $4,000.

H. Haegele, one-st'y brick stable, 35′ x 50′, 156 Dayton St.; cost, $2,000.

Jackson & Wilzinski, two additional stories, 60′ x 70′, North Pier; cost, $9,000.

H. Shoemaker, three-st'y brick dwell., 27′ x 50′, 299 Wells St.; cost, $6,500.

E. Sturtevant, two-st'y brick dwell., 22′ x 48′, 233 Peoria St.; cost, $4,000.

B. P. Hutchinson, four-st'y brick stores, 38′ x 80′ 47 and 49 Fifth Ave.; cost, $30,000.

John Mulson, three-st'y brick store and dwell., 25′ x 70′, 571 Nobles St.; cost, $5,000.

New York.

BUILDING PERMITS. — *Lexington Ave.*, cor. One Hundred and Sixteenth St., 1 four-st'y brown-stone tenement, 24′ x 64′; cost, $15,000; owner, H. O'Neil, 1267 Broadway, room 24; architect, M. C. Merritt.

Seventy-Eight St., 2 three-st'y Connecticut brown-stone dwells., 16′ x 45′ and 55′; cost, $9,200 and $8,500; owner, Washington Broas Haverstraw; architect, Charles Baxter; builder, W. Harlow.

One Hundred and Twenty-Third St., 6 three-st'y Connecticut brown-stone dwells., 16′ 8″ x 50; cost, $9,000 each; owner, W. W. Adams and Robert McGinnis, Fourth Ave., near One Hundred and Twenty-Sixth St.; architect, Charles Baxter.

Pleasant Ave., cor. One Hundred and Fifteenth St., 1 four-st'y Connecticut brown-stone apartment house, 22′ x 70′; cost, $12,000; owner, Martha White, One Hundred and Thirty-Eighth St., near St. Ann's Ave.; architect, Charles Baxter; builders, Michael Daly and C. White.

Pleasant Ave., 3 four-st'y Connecticut brown-stone apartment-houses, 18′ x 60′; cost, each, $10,000; same owner, etc., as last.

Eighty-Sixth St., cor. Ave. A, 4 four-st'y brown-stone apartment-houses, 25′ x 60′; cost, one $13,000 and three $11,000 each; owner, John Sedgwick, 132 Nassau St.; architect, Charles Baxter.

Avenue A, 2 four st'y brown stone apartment-houses, 25′ x 60′; cost, $11,000 each; owner, John Sedgwick; architect, Chas. Baxter.

Avenue A, five-st'y brick tenement, 25′ 1″ x 51′; cost, $10,000; owner, Daniel Cogney; architect, Fr. S. Barus.

One Hundred and Forty-Third St., 1 two-st'y frame dwell., 20′ x 36′; cost, $2,000; owner, Mrs. G. E. Howell, on premises; architect, Louis Falk; builder, James Hall.

One Hundred and Third St., 2 four-st'y brick flats, 25′ x 60′; cost, $11,000 each; owner, A. M. Jenny, 335 East One Hundred and Fourth St.; architect, J. H. Valentine; builder, J. Jenny.

One Hundred and Twelfth St., 2 five-st'y brick tenements, 25′ x 53′; cost, $8,000 each; owner, A. M. Jenny; architect, J. H. Valentine; builder, J. Jenny.

Sixty-Ninth St., 14 four-st'y brown-stone flats, 25′ x 76′; cost, $14,000 each; owner, William Noble, 181 Broadway; architect, J. M. Grenell.

West Eighty-Fifth St., Nos. 4 and 6, four-st'y brick dwell., 34′ x 100′ 5″ x 24′ x 100′ 5″; cost, $120,000; owner, W. J. Hutchinson, 5 Wall St.; architect, Geo. B. Post; builders, A. A. Andruss & Son, and Meeker & Hedden.

West Thirty-Fifth St., No. 365, rear, 1 four-st'y brick tenement, 25′ x 25′; cost, $4,500; owner, D. W. O'Halloran, 10 East Broadway; builder, Thos. Green.

Lewis St., No. 162, 1 one-st'y building for storage of charcoal, 21′ x 100′; cost, $10,000; owner, Arthur McConnell, 60 Sheriff St.; architect, Edward Kenny.

One Hundred and Eighteenth St., 3 three-st'y brown-stone dwells., 17′ 8″ x 45′; cost, $6,300 each; owner, James Gault, 210 West Fifty-Third St.; architect, Emile Schultze.

One Hundred and Forty-Third St., 3 two-st'y brick dwells., 16′ 8″ x 40′; cost, $2,850 each; owner, George Bell; builder, John Knox.

One Hundred and Thirty-Third St., 6 three-st'y brown-stone dwells., 16′ 8″ x 45′; cost, $9,000 each; owners and builders, W. B. and O. Barton, 1996 Sixth Ave.; architect, J. H. Valentine.

One Hundred and Twenty-Ninth St., 1 four-st'y brown-stone flats, 25′ x 60′; cost, $12,000; owner and builder, G. H. Dean, 168 East One Hundred and Twenty-Fifth St.; architect, J. H. Valentine.

Sixth Ave., cor. One Hundred and Fifteenth St., 1 three-st'y brick dwell. and stable, 50′ 7″ x 62′; cost, $50,000; owner, John H. Sherwood, 1 East Forty-Fourth St.; architect, J. E. Terhune; builder, J. Thompson.

Seventy-Eighth St., 1 four-st'y brick tenement, 25′ x 60′; cost, $7,000; owner, John E. Hoffman, 14 East Sixty-Fourth St.

Willis Ave., near One Hundred and Thirty-Fifth St., 3 brick three-st'y dwells., each 16′ 8″ x 45′; cost, $5,000 each.

Fifty-Fourth St., near Sixth Ave., two one-story stores; cost, $2,500 each.

Fifty-Fifth St., near Sixth Ave., two similar buildings; cost, $5,000.

Christie St., No. 89, brick three-story stable 19′ x 100′; cost, $6,000.

There have been filed, in addition to the above, a large number of plans for small buildings, workhouses, shops, etc.

Alterations. — *East Fifty-Third St., Nos. 329 to 341*, five-st'y brick extension, 28′ x 60′; cost, $7,400; owners, Henry Wallach's Sons, 67 Thomas St.; architects, D. & J. Jardine; builder, Wm. Haigh.

St. Mark's Pl., No. 54, interior alterations; cost, $5,000; owner, Jac. Beck, No. 45 St. Mark's Pl.; architect, J. Hoffman, builders, P. Schaffler and Grissler & Fausel.

Park Ave., No. 94, one-st'y brick extension, 16′ 5″ x 20′; cost, $2,500; owner, Emily Underhill; architect, S. D. Hatch; builder, A. Brown, Jr.

Waverley Pl., No. 57, raised half-st'y, also three-st'y brick extension, 13′ x 20′; cost, $2,500; owner, John Lefferts, on premises; architect, C. H. Jacobus; builders, A. B. Carlock and C. H. Jacobus.

Eighth Ave., No. 71, two-st'y brick extension, 25′ 9″ x 50′; cost, $3,000; owner and builder, George Hayes, on premises.

First Ave., cor. Fifty-Fifth St., two-st'y brick extension, 8′ x 17′; cost, $4,000; owner, W. Wirsing, on premises; architect, A. Wagner; builder, A. Zrigler.

East Fourteenth St., No. 7, front and interior alterations; cost, $2,500; owner, John Biddle, 13 Washington Sq.; architect, W. Jones; builders, Drummond & Jones.

East Eighty-Second St., No. 174, raised one-st'y and four-st'y brick extension, 16′ x 25′, altered for apartment-house; cost, $5,000; owner, W. H. McCarthy, on premises; architect, J. C. Burne; builder not selected.

Eleventh Ave., No. 853, raised four feet, rebuild side and rear walls; cost, $2,100; owner, Mrs. Shelter, on premises; builder, J. Jordan.

Yellow Pine. — It is reported in the daily papers that the receipts of Southern yellow pine at New York for nine months of this year reached 108,122,200 feet, against 100,320,005 for the whole of 1879, and 32,848,620 for 1877. The lumber came into increased demand in 1878 for railroad ties and general building. It is delivered at New York for $23 to $27 per 1,000 feet generally, though choice lots often bring higher prices. Pensacola shipped 82,150,000 feet in the year ending with September; Darien, Ga., 55,792,538 from January to July; Mobile, 1,898,000 feet from January to September; while Savannah ships about 60,000,000 feet annually, a third of it to New York.

Library. — Another wing to the Astor Library is in course of erection, in accordance with the will of William B. Astor. When completed it will have a frontage of about 150 feet, and a capacity for 400,000 volumes.

Bar Association Building. — The Bar Association owns a vacant piece of land, 30 feet in width, adjoining its large building in Twenty-Ninth St. The project of using this ground for an addition to the main building has been under discussion for some time. At a recent meeting a resolution was passed, approving of such a step, and the executive committee was instructed to get architects' plans for a structure not to exceed $25,000 in cost.

Stables. — For S. L. Bowman & Co., stables 50′ x 92′, three stories high, of brick, are to be built from designs of Mr. M. C. Merritt.

Building Materials remain about as last week; brick, however, is a trifle higher, and is firmly held at our quotations.

Philadelphia.

Building Permits. — *Memphis St.*, between Pepper and Reakin Sts., 6 two-st'y dwells., 14′ x 33′; Thos. L. Kelly, owner.

Frankford Road and Orchard St., one-st'y office, 20′ x 40′; R. C. Taylor, contractor.

Silver Lane Ave., cor. Thirty-Eighth St., 6 three-st'y dwells., 15′ x 46′; Jas. C. Shedwick, owner.

Spring Garden St., between Thirty-First and Thirty-Second Sts., one-st'y store, 14′ x 30′; Thos. Costigan, owner.

Bristol St., between Fifteenth and Sixteenth Sts., three-st'y dwell., 15′ x 40′; J. C. Beyer, owner.

Master St., near Thirteenth St., three-st'y dwell., 16′ x 56′; C. C. Carman, contractor.

Tulip St., near Norris St., 2 two-st'y dwells., 15′ x 30′; Jas. Rush, owner.

Fourth St., near Willing Alley, five-st'y office building, 77′ x 46′; Chas. D. Supplee, contractor.

Martha St., No. 2447, two-st'y dwell., 18′ x 32′; J. C. Stackhouse.

Frankford Road, No. 2353, one-st'y store, 28′ x 40′; J. W. Rees, owner.

Master St., cor. Eleventh St., store, 18′ x 54′; C. J. Crossen.

Ridge Ave., cor. Hermit Lane, three-st'y dwell., 25′ x 60′; W. Goodfellow, contractor.

Filbert St., cor. Merrick St., passenger railway station, 122′ x 192′; Pennsylvania R. R. Co., owners.

Sergeant St., between Emerald and Carroll Sts., two-st'y weaver shop, 30′ x 36′; Sam'l Patterson, owner.

Sharp St., near Adams St., two-st'y dwell., 14′ x 32′; David H. Barper, owner.

Fifth St. near Somerset St., two-st'y dwell., 16′ x 42′; W. Hickman, contractor.

North Front St., No. 935, five st'y factory, 32′ x 81′; S. Humphrey.

Nineteenth St., near Oxford St., two-st'y storehouse, 17′ x 60′; Frederick Fageley, owner.

Charlotta St., near Girard Ave., 5 two-st'y dwells., 12′ x 36′; W. Archer, contractor.

Thirty-Second St., near Powellton Ave., one-st'y hot-house, 30′ x 40′; Aug. Lutz, owner.

Twenty-Seventh St., cor. York St., two-st'y stable, 20′ x 40′; Fred. Essey, owner.

North Front St., Nos. 933 *and* 935, morocco factory, six stories, 32′ x 81′, walls of brick; Mr. Geo. Allen, builder.

Alterations. — *Howard St., No.* 2349, new front to dwell.; A. B. Levis, contractor.

West Girard Ave., Nos. 318, 320, *and* 322, 3 front alterations; Jos. McGregor, contractor.

South Seventh St., No. 26, front alteration; W. C. McPherson.

North Eighth St., No. 60, front and internal alterations; Chas. F. Shuster, owner.

Walnut St., No. 413, front and internal alterations; J. B. Doyle, contractor.

Additions. — *Spring Garden St., No.* 2014, fourth-st'y addition to dwell., 20′ x 30′; L. Koder.

Brown St., No. 727, fourth-st'y addition to dwell., 16′ x 30′; Stephen Morris & Son, contractors.

Mt. Vernon St., No. 1621, fourth-st'y addition to dwell., 18′ x 30′; Stephen Morris & Son, contractors.

Howard St., cor. Huntingdon St., four-st'y addition to factory; Jno. S. Steel, contractor.

Factories. — Among the extensive manufacturing improvements occurring at the present time in the southwestern section of the city, are to be found those of Mr. Geo. Campbell, manufacturer of woolen yarns, who will, in addition to his present mill, cor. Twenty-First St. and Washington Ave., have, by the first of the year, completed a large factory-building on the square bounded by Reed and Dickinson Sts., and Thirtieth and Thirty-First Sts.; main building, 65′ x 380′, two stories high, with a lantern roof extending the whole length of the building. The building will be lighted by 246 windows. In addition to the above, an engine-house, 19′ x 49′, a boiler-house, 32′ x 48′, and a picker-house, 17′ x 36′, are to be built.

Foundry. — John I. Dawson & Bro., of Gray's Ferry Iron Foundry and Machine Works are about to erect buildings that will cover about two acres of ground, on Gray's Ferry Road, between Twenty-Ninth and Thirtieth Sts. The principal building is a foundry, one story high, 75′ x 200′, in addition to which will be a machine-shop 50′ x 100′, a boiler-shop, 40′ x 60′, to be completed by January 1, 1881.

Machine Shops. — At the Wharton Railroad Switch Company's Works, on Washington Avenue, between Twenty-Third and Twenty-Fourth Sts., there is being erected a building, 50′ x 145′, designed for an engine-room, boiler-shop, and machine and erecting shop. The blacksmith-shop is receiving an addition, 65′ x 112′; also, the present shop is being extended 25 feet.

Providence, R. I.

Alterations. — Augustus Hoppin is making alterations in the old residence at the corner of Westminster and Walnut Sts., from plans by Howard Hoppin, architect. Carpenter, Henry Reed; masons, Mason & Coppell.

Daniel W. Lyman has commenced the work of transforming his residence at the corner of Westminster and Walker Sts. into stores and offices. Mason work, Nathan Horton; carpenter, Spencer P. Reade; the latter makes the plans. Cost, about $4,000.

Mr. S. G. Martin is making alterations to his house on the corner of Knight and Broadway, from plans by Stone & Carpenter.

Houses. — Thomas McDonough is building for himself a house, a story-and-half cottage, on the corner of Brattle and Lilac Streets.

M. H. Hartwell is building an English cottage at the corner of Daboll & Greenwich Sts., from plans by Howard Hoppin, architect. Carpenter's work, William Urquhart; masons, Mason & Coppell; cost, about $8,000.

Mr. Ira B. Congdon is building a small two-story and French roof tenement-house on School St.

Mrs. Rachel M. Jackson is building a double two-story and French roof house on Friendship St. Mr. Wm. O. Wardwell has charge of the work.

Stores. — Billings Bros. are building a three-st'y brick block, plain in character, on corner of Worcester and Eddy Sts. Mr. John Briggs does the mason-work by the day.

St. Louis.

Building Permits. — Thirty permits have been issued since our last report, of which eight are for frame structures of slight importance. Of the rest, those worth $2,500 or over are as follows: —

Owners' Name.	Use.	Str's	Fms	Cost.
Mrs. L. V. S. Hines,	Warehouse,	2	2	$4,000
P. H. Herminghaus,	Dwell.	2	13	5,800
F. Cornet,	Dwell.	3	9	4,500
Mrs. L. Hackman,	Dwell.	3	9	4,500
Union Department,	Dwell.	3	9	3,800
Warehouse Company,	Warehouse,	3	4	20,000
— Tentenberg,	Dwell.	2	6	4,800
Val. Koenig,	Dwell.	2	16	5,500
H. Koch,	Dwell.	2	18	4,000

General Notes.

Anderson, Ind. — The house for Messrs. Lane Bros. is building by Mr. C. A. Wallingford, architect, of Indianapolis.

Cohasset, Mass. — Messrs. Kirby & Lewis, architects, of Boston, are about to build a cottage at Island Beach. Cost, $6,500.

Greencastle, Ind. — Mr. C. A. Wallingford, of Indianapolis, is the architect of the engine-house, which is to cost $6,000.

Hoboken, N. J. — Mr. S. B. Dod is to have a fine residence built from designs of Mr. H. E. Ficken of New York. This house will not be of the ordinary style of city architecture, but will be a picturesque treatment of red brick with colored and moulded brick trimmings.

Indianapolis, Ind. — A house is building for W. Ketcham, Esq., from the plans of Mr. E. H. Ketcham, architect. Cost, $4,000.

Mr. C. A. Wallingford is the architect of three houses now building for Mr. John Wolcher; cost, $5,000.

Jamaica Plain, Mass. — Messrs. Wilson Brothers are building a wooden house at the corner of Pond and Eliot Sts. for Mr. T. F. Downes; Messrs. N. J. Bradlee & Winslow, architects.

Lafayette, Ind. — Mr. C. A. Wallingford, of Indianapolis, is building a house for Mrs. W. F. Reynolds. Cost, $15,000.

Lynn, Mass. — St. Paul's Methodist Episcopal Church is being strengthened about the roof, ceiling, etc., and interior to be redecorated and improvements made about the pulpit and orchestra under architectural supervision of T. W. Silloway, of Boston.

Nantasket, Mass. — A summer residence is being built for Mr. Wm. G. Hyde, by Mr. Isaac Cushing, size 50′ x 50′; Messrs. Allen & Kenway of Boston, architects.

North Attleboro, Mass. — Additions are being made to the Wamsutta Hall, which provides for a little more than eight hundred square feet more stage room, besides additional dressing rooms, and a new stage entrance. The audience room has been newly decorated. Plans for the work by Walker & Gould, architects, Providence, R. I. Work is being done by Andrew Slade, of Pawtucket, R. I.; cost, $2,000.

Orange, N. J. — Three dwellings, at a cost of about $6,000 each, are being built for Mr. F. M. Sheppard, from designs of Messrs. Lamb & Wheeler of New York. The same architects have also drawn plans for a $25,000 house for Mr. J. A. Minott.

Peoria, Ill. — There is a prospect of a new opera-house being built here within a year. Mr. Oscar Cobb, an architect of Chicago, is endeavoring to interest the citizens in the scheme, and as prominent capitalists have taken hold of the matter, it will probably go through.

Ridgewood, N. J. — For Mr. Walsh, a frame dwelling to cost $8,000 is to be built from designs of Messrs. Lamb & Wheeler of New York.

Summit, N. J. — A frame house to cost about $9,000 is to be built for Mr. Libby. Messrs. Lamb & Wheeler of New York are the architects.

St. Paul, Minn. — St. Paul has built $403,500 worth of business blocks this year, $168,300 of public buildings, $268,000 of mills, elevators, etc., $749,100 of private buildings, and $270,000 worth of railroad structures. The new St. Paul elevator, just finished, cost $150,000, and there are some half-a-dozen new mills and factories, whose average cost reaches $20,000. The railroad buildings include the new union depot, $75,000; the St. Paul and Omaha shops, $67,000; and the Northern Pacific and St. Paul and Omaha general buildings and freight-houses, $60,000 each. The public improvements by the railroad companies, in addition to the actual erection of buildings, has involved the expenditure of $210,000 the present season, while the public improvements by the city and street railroad, water and gas corporations have cost nearly $200,000 more.

Toledo, O. — City work-house, brick and stone; cost about $15,000; E. O. Fallis, architect.

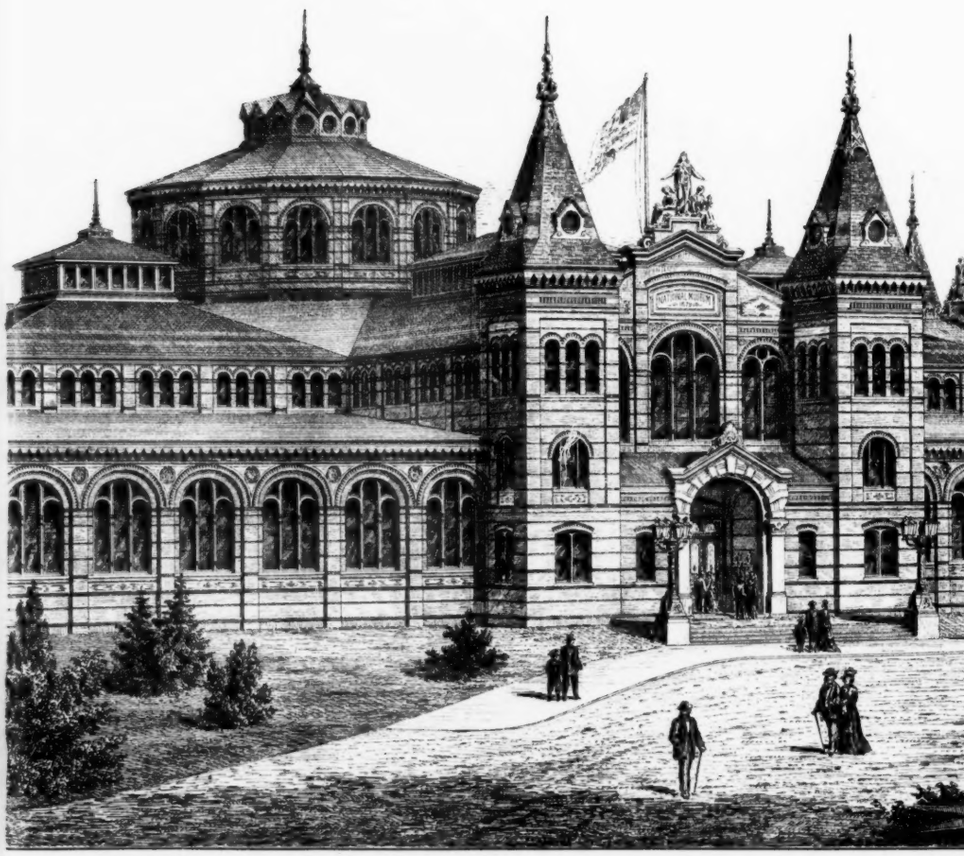
Worcester, Mass. — The excavations for a two-story double-tenement frame building are being made on the premises of Mr. Beaumont, on Chandler St., 24′ x 39′; Mr. William Powers, builder.

The plans are ready and excavations are begun for a new two-story double tenement-house, on the northerly side of Shrewsbury St., for Patrick Dolan. The dimensions are 24′ x 30′; Mr. George S. Glough is the builder.

Industrial.

Bridesburg, Pa. — Contracts have been entered into by Edwin H. Filter & Co., for a spinning-mill, hawser-house, rope-walk, tar-house, boiler-house, stables and offices. The spinning-mill, already well advanced, will be 314 feet long, 54 feet wide, with a wing 68 feet in extent, the whole built of hard brick, four stories in height. It will be provided with elevators, fire-proof doors, fire-escapes, and fire-apparatus. The hawser-house will be 260 feet long, while the rope-walk will stretch for a distance of 1,200 feet. The other buildings are of proportions to correspond with the immense size of those whose dimensions have been given.

THE NATIONAL MUSEUM WASHINGTON, D.C.



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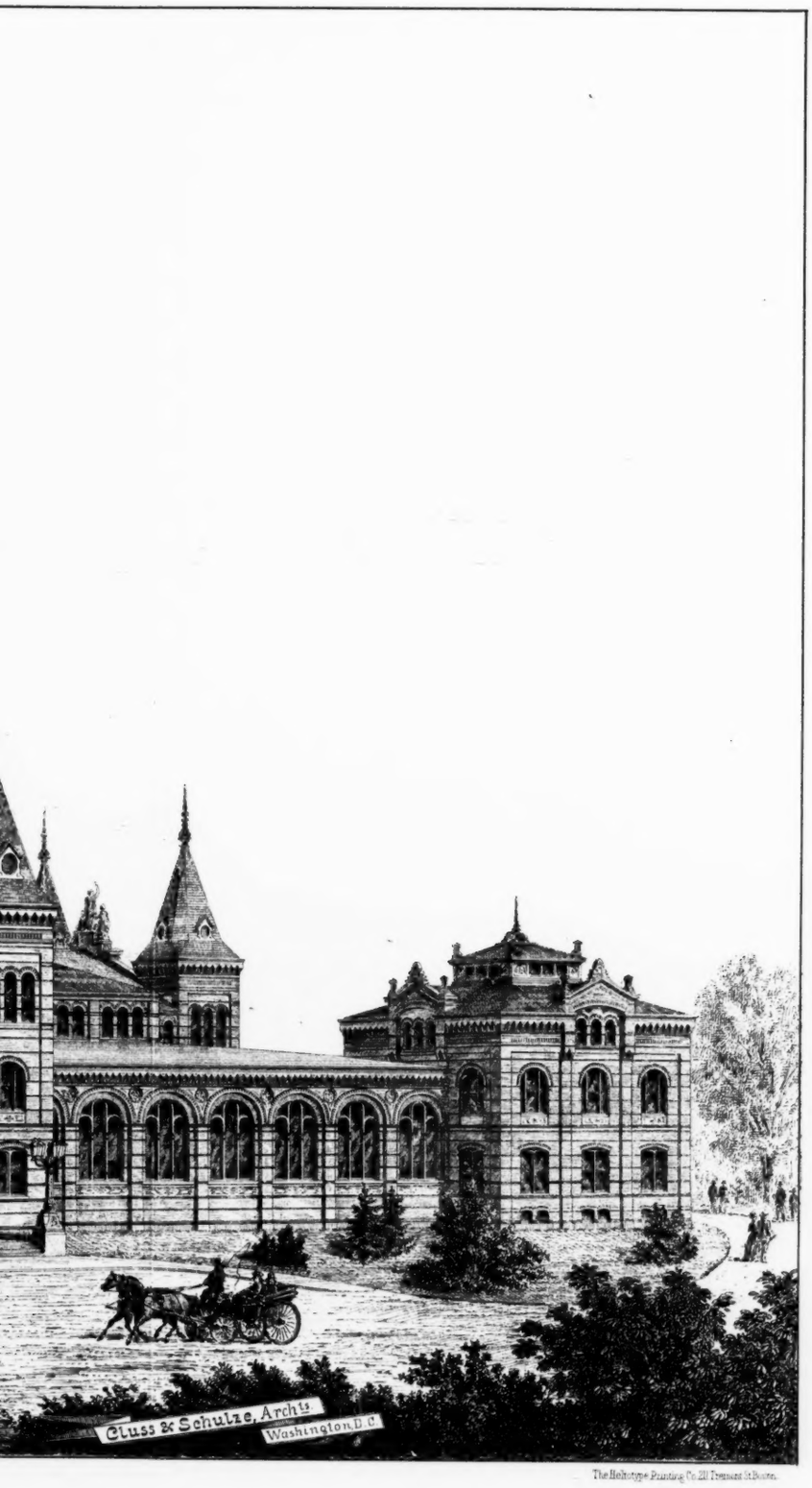
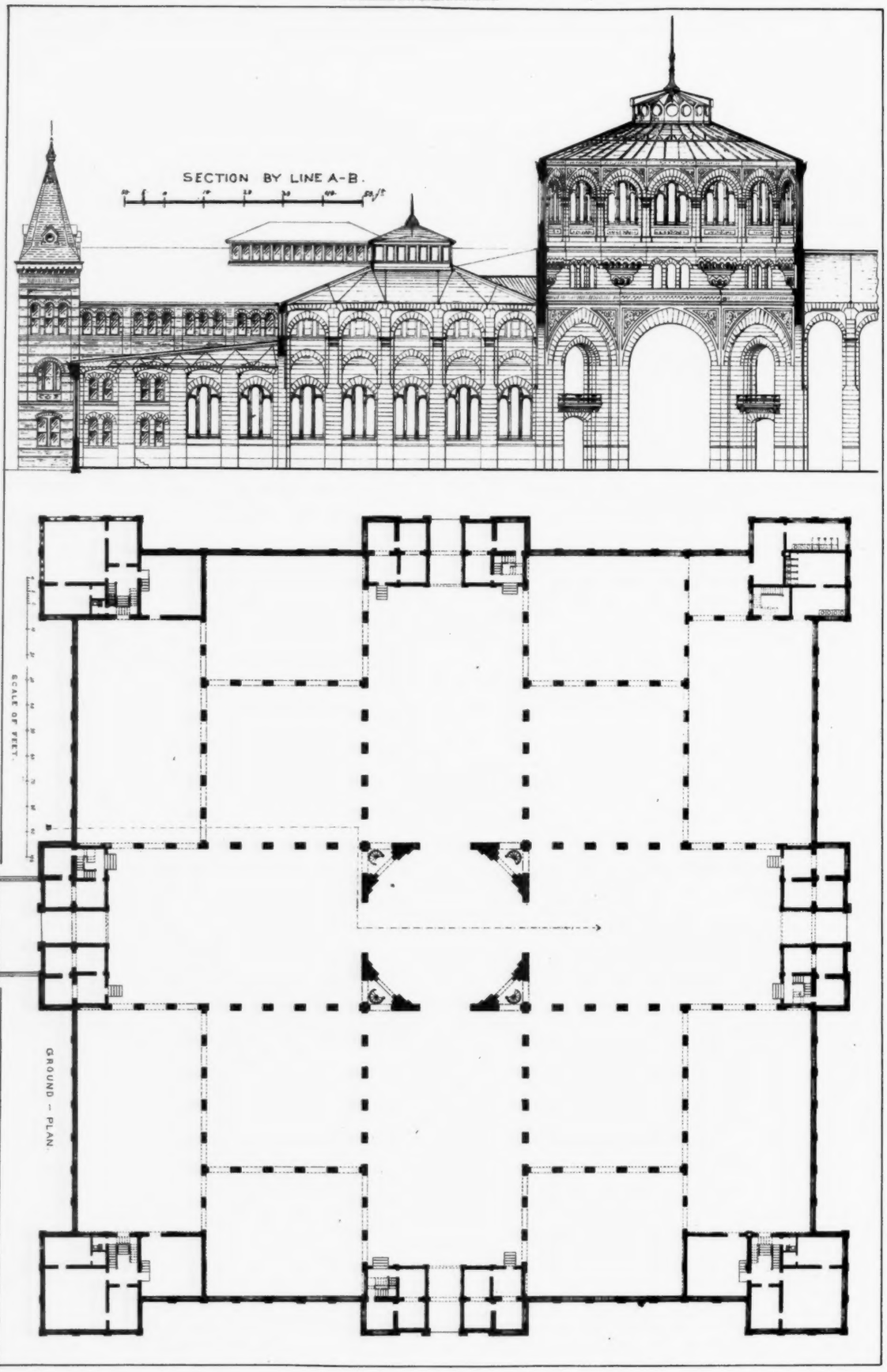
No. 252

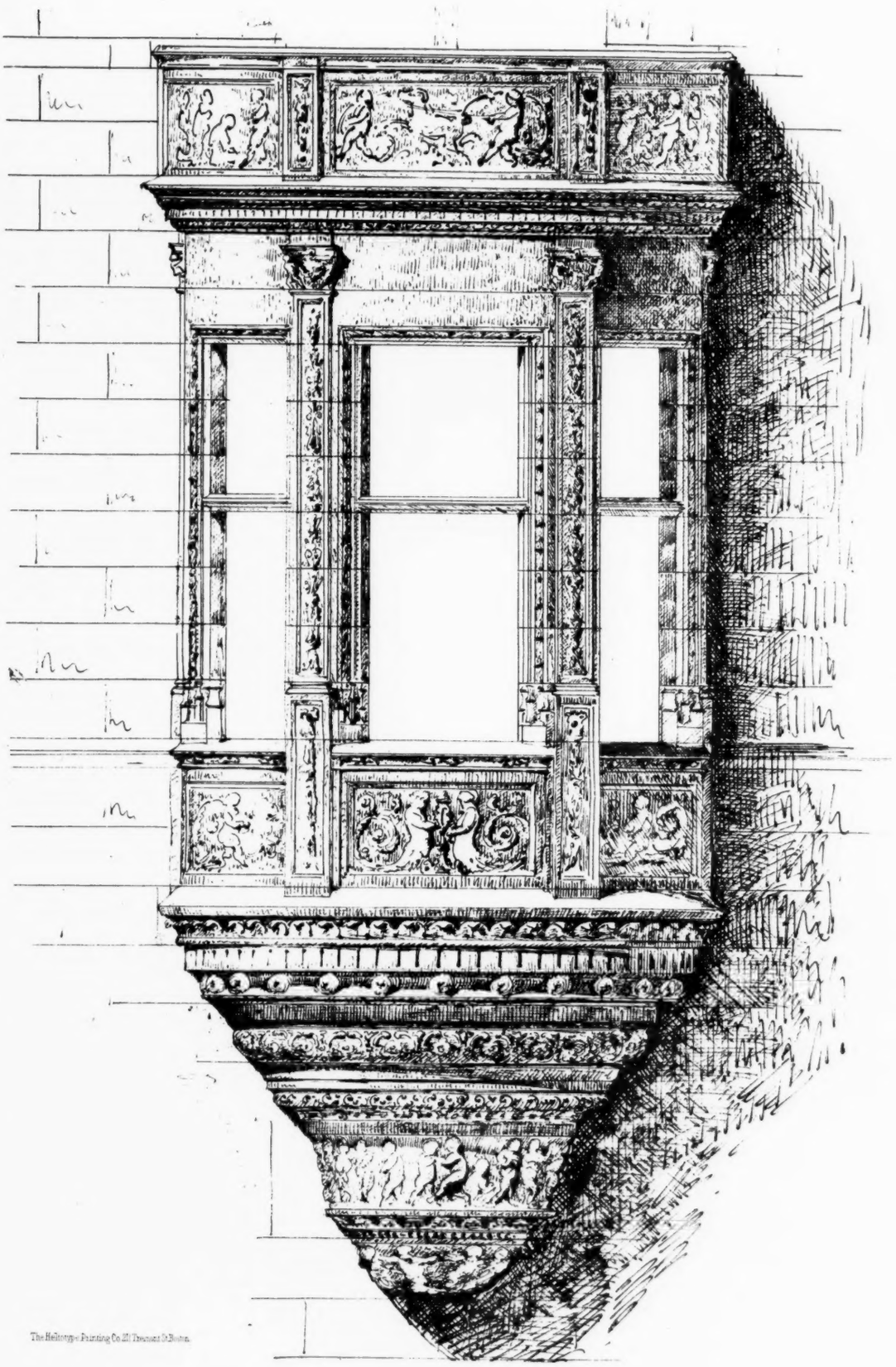


The Heliotype Printing Co. 211 Tremont St. Boston.



THE NATIONAL MUSEUM, WASHINGTON, D.C.

Cluss & Schulze, Architects.



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ORIEL FOR THE HOUSE OF C. VANDERBILT.

NEWYORK, N. Y.

R. M. Hunt, Arch't