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IT is announced, apparently on good authority, that the insurance companies doing business in Boston have decided to introduce into that city the Universal Mercantile Schedule, and that as soon as the proper arrangements can be made, which will be in a few days, premium rates on buildings and goods in the business part of the city will be determined by the schedule. This document, to which we referred a few weeks ago, is the work of a small committee, representing the insurance interests of the country, and is intended to furnish the basis for a radical remodelling of premium rates, under which a fixed rate is charged for a certain class of building, which is described at length, and for the goods kept in it, and for all unfavorable variations from the standard, either in the character of the building, or the local circumstances, a specified addition is made to the rate, while improvements on the standard are encouraged by a deduction from the rate. As we have said before, we think that architects will find something to criticise in the schedule, but it seems to furnish by far the best means yet devised for placing the business of fire-insurance on a fair and rational basis, and its adoption for a first-class city like Boston is a very important step, not only for the underwriters, but for real-estate owners and merchants. It is probable, of course, that the effect will be to raise rates on the defective and dangerous buildings, of which so many exist in Boston, and on the goods contained in them, but the discrimination which the schedule makes in advancing rates in such cases is infinitely better than the uniform addition of one per cent to all mercantile premiums, which was at first proposed, and it is to be remembered that, as the schedule is intended to be based on the actual risk, as observed during many years by the most experienced men in the profession, the increase of premiums on hazardous buildings will be accompanied by a reduction in cases where the hazard is very slight, as in dwelling-houses; and the excessive taxation of the careful owners of buildings little exposed to danger from fire, to make up losses due to the inadequate rates charged on flimsy mercantile structures, which has been the rule with underwriters, will be modified. Another valuable feature of the schedule rating is that, if it is honestly followed by the Boston underwriters, any owner of goods or buildings can ascertain for himself, by referring to the schedule, what rates he will have to pay. It is hardly necessary to say that as soon as merchants are convinced that the premium rates which will be charged them will depend on the risk, and not on the enterprise of the broker who gets their insurance for them, they will begin to inquire whether they cannot do something to diminish both the risk and the premium. A man who carries policies on half a million dollars' worth of goods is likely to find a document like the schedule very interesting reading, and the suggestions which it furnishes in regard to the care of buildings, as well as their construction, are sure to bear good fruit.

A GOOD deal of discussion is going on just now in relation to the causes and characteristics of fires in various sorts of buildings, and it is needless to observe that the details of the discussion have great interest for architects. Nothing is more common, after a fire in a so-called "slow-burning" building, like the Ames and other buildings lately destroyed in Boston, than to hear such sneering remarks as "that was what the architects call a fireproof building. I wonder why they cannot learn something about their business." The fact is that architects, who know better than any one else, fire-engineers excepted, what sort of buildings are fireproof, never have admitted that a construction of wooden beams and planks was fireproof, or anything except, under certain circumstances, slow-burning; and the ridiculous claim that a building with light wooden floors, varnished on the under-side, is fireproof simply because it has an inch more thickness of boarding over it than one of the usual kind, is, so far as we know, made only by owners and real-estate agents. Even insurance men, who, as we think, have set an exaggerated value on the virtues of two-inch planks, do not seem to have had any substantial basis for their opinion. It was reported a few days ago that all policies of insurance in Boston on buildings having floor-beams of pitch-pine were to be cancelled, on account of the particularly inflammable nature of that timber. It is not likely that any such proceeding, which would deprive of insurance nearly all the so-called "slow-burning" buildings in the city, was ever really contemplated, but the report certainly indicates that some insurance man had been seized with the notion that a building with pitch-pine beams and floors was more combustible than one with spruce or white-pine timbers. Architects, of course, do not need to be told that the contrary is the case. While pitch is, undoubtedly, an inflammable material, the timber containing it is so dense and heavy as to be kindled with far more difficulty than the light spruce or soft pine. When exposed to great heat, a cubic foot of pitch-pine, which weighs about fifty pounds, will burn with more intensity than a cubic foot of spruce, which weighs only thirty, just as fifty pounds of coal will produce more heat than thirty pounds; but the same rule applies to the extra thickness of floors so much favored by underwriters, and it is not at all evident why an additional sixty per cent of inflammable material spread on top of a floor should be a good thing, while an addition of sixty per cent to the weight of the timbers supporting it should be so bad a thing that the underwriters should refuse to insure buildings so treated.

SPEAKING of the virtues of plank floors, Mr. C. J. H. Woodbury writes us that he disagrees with us in our doubts as to the merits of such floors for mercantile buildings, and sends us a notice of a mill-fire in 1891, in which, for the first and only time in the experience of his company, a thick plank floor was known to have been burned through. With all deference to Mr. Woodbury's opinion, for which we have as great a regard as for that of almost any man living, we still think that the conditions existing in mills differ too much from those found in city mercantile buildings to make the experience of mill insurance companies applicable without discrimination to city construction. In such a structure as the Ames Building, for example, the heat generated by the burning of the vast masses of combustible goods stored in the rooms is intense almost beyond conception. In such fires, iron columns, thick glass skylights, and even brick walls, melt, and the temperature throughout a space covered by the structure, and for a height which, in the case of the Ames Building, is said to have been nearly two hundred feet, must be far above white heat. When immersed in such a temperature, either by

the burning of goods around it, or by an attack through the windows of a sea of flame from a neighboring building, timber, instead of burning from the outside, seems to decompose suddenly, setting free large volumes of gas, which leave the non-volatile part of the timber in the shape of a loose heap of charcoal, torn to fragments by the violence with which the gases, and, perhaps, a little steam, have been liberated. During the burning of the Ames Building great numbers of fragments of blazing charcoal, several inches long, and appearing to have been separated from large timbers, fell in the neighboring streets, and the violence with which the flames poured through the windows, and across a street fifty feet wide, setting fire instantly to the buildings on the opposite side, shows how freely the great mass of fuel furnished by the structure itself, as well as by the goods stored in it, must have burned.

FIRE AND WATER has an excellent article, partly quoted, apparently, from the *Engineering Magazine*, on the fire in the Chicago Athletic Club, one of the few structures of masonry and protected iron in which a destructive fire has ever occurred. The building was a very lofty one, — nine stories high, we think, — so that it had something the effect, in increasing the force of the fire, of a cupola-furnace, and, although structurally fireproof, there was a great deal of inflammable material in it, all the floors being laid with two thicknesses of inch boards on wooden sleepers, the corridors being wainscoted five feet high, and the gymnasium, which was twenty-five feet high, panelled to the ceiling with wood on wooden grounds. This woodwork — much of which, though stacked in the building, had not yet been put in place — with that furnished by the doors, windows and other finish, was sufficient to generate a heat which burned off all the plastering, except a few patches, consumed the doors and windows, with their frames and casings, the floors, with, in many instances, the sleepers on which they were laid, which were covered with concrete on three sides, and all wainscoting, panelling and bases, and melted the glass out of the skylights. Notwithstanding the intensity of a heat which could effect this, the structure of the building remained practically uninjured. The floors, laid with tile arches between iron beams, were not penetrated anywhere, the fire spreading from story to story entirely through the windows opening on a contracted court-yard; not a single arch fell, and on testing those which seemed to have suffered most, they were found capable of sustaining a weight of four hundred and fifty pounds per square foot, without a sign of rupture. Even the fireproof-block partitions, although the doors and frames were burned out of them and the plastering blistered off, were practically intact, so that if marble had been used for wainscoting and tiles for flooring, as is usual in fireproof mercantile buildings, or if the upward spread of the flames through the court-yard had been provided against, there is good reason to believe that little damage would have been caused by the fire.

THE Report of Fires of the Boston Manufacturers' Mutual Fire Insurance Company for 1892 is, as these reports always are, a very interesting document. To our mind, no one knows so much about fires as the officers of the mill mutual insurance companies, for the reason that no one else gets so much clear and accurate information on the subject. During the year 1892 two hundred and seventy-eight fires occurred in manufactories in which the Boston company had an interest, and the circumstances attending them were, in consequence, fully reported to the officials, and the same thing has been done for many years previously; while, in regard to ordinary fires, hardly anything is ever known about their origin, and not much about the way in which they spread, or the details of their destructive work. For example, these reports have shown clearly, what was hardly suspected before, that cotton and woollen goods dyed with certain colors are liable to spontaneous ignition. Thirteen fires occurred last year from this cause alone in the factories in which the Boston company has an interest; and the consequence is that both manufacturers and insurance inspectors see that goods dyed with these colors are kept in a safe place; while, with the information attainable in regard to ordinary fires, many years might have elapsed, and millions of property might be destroyed, before the dangerous character of such goods would have been brought to light. In most cases, these fires were promptly extinguished by automatic-sprinklers, the inestimable value of which, for checking fires at the beginning, is every day more evident.

SOME of the fires were set in a singular manner, the account of which is very instructive. In a machine-shop a locomotive-boiler was being repaired. The steam-dome had been removed, so as to allow a man to get inside the boiler, and about a pint of benzine had been applied to some of the interior bolts and screws, apparently for the purpose of loosening them, so that they could be removed. The men at work on the boiler went off to their dinner, and, on their return, one of them got inside to remove the bolts, while a man standing outside handed him a light. The moment the light came in contact with the air from the boiler, slightly impregnated, as this was, with the naphtha vapor, a tremendous explosion occurred. The man outside who was handing the light was instantly killed, and another, who was standing on top of the boiler, was thrown to the ground, and badly bruised; while the man inside was blown through the dome opening, fourteen inches in diameter, and thirty feet upward, where he struck the iron roof-truss, lodging there so firmly that he was pulled out by the travelling crane, but in such a condition that he died some hours afterward. It is well-known that a mixture of a small quantity of naphtha vapor with a large quantity of air may be explosive, but no attempt seems to have been made to determine the limit of explosive proportions. In another case, the feed-pipe of a boiler, which was placed at the back, burst, allowing water to escape into the fire. The steam generated blew open the furnace-doors, and forced the flames out into the boiler-room. The doors and windows, and the ventilator in the roof, were immediately set on fire, but the ever-watchful automatic-sprinklers opened, and held the flames in check until two hydrant-streams could be turned on. A somewhat similar accident took place in a mill where shavings were blown under the boiler for fuel. The shaving-blower was stopped for a moment, causing a back draught in the boiler-furnace, which sent flames through the furnace-doors, setting fire to the shavings in the boiler-room. Here, as before, the automatic-sprinklers promptly opened, keeping the fire in check until a stream from a hose could be applied.

A SINGULAR fire was caused by the ignition of coal piled up against the outside of a boiler-house. There were thirty-two inches of brickwork between the boiler-setting, which was in contact with the wall, and the coal, but sufficient heat had passed through to set the coal on fire. Even where there is no extraneous heat, bituminous coal will sometimes ignite spontaneously, as has been clearly demonstrated by the mill mutual companies; and last year three fires were due to this cause. Lightning caused eight fires, most of which were extinguished by the sprinklers. In one case, a cotton-mill was struck twice in the same evening. The first bolt struck the picker-room, early in the evening, setting fire to fifteen hundred pounds of laps, but two sprinklers opened, and held the fire in check until a stream from a hose was put on it. About the same moment, the cotton-house, containing four thousand bales of cotton, was struck. The cotton was divided among several rooms, the room through which the bolt passed containing four hundred bales. Nobody noticed the fire in the cotton-house until four o'clock the next morning, when some one observed water coming out of one of the doors. It was then discovered that the lightning had set fire to the cotton, four bales of which were entirely consumed, and thirteen others scorched, but that four automatic-sprinklers, which were in the room, had opened, and kept the fire in check all night, not only confining it to the room in which it originated, but reducing it to a mere smoulder, which, in nine hours, had only consumed four bales of cotton out of the four hundred in the room. It is a familiar fact that it is very difficult to extinguish fire in bales of cotton. There are many cases where burning cotton bales have been, apparently, soaked with water, but have broken into flame again repeatedly afterwards; and, in the present instance, it was considered necessary to apply hydrant streams to complete the work of the sprinklers.

ARCHITECTURE OF THE LOW COUNTRIES.[1]—IV.

Fig. 22. Belfry at Mons.

During the period which we are describing a few interesting belfries were erected, as at Mons (Fig. 22) and Commines, and some important city-gates. The most notable in Holland are those of Enkhuizen and Hoorn. In 1866 the municipality of Antwerp demolished the gates of Berchem and Borgerhout, the most monumental in Belgium. The gate of Berchem (Fig. 23), built between 1543 and 1545 by the engineer Van Schoonbeke after the plans of Donato Pellizinoli, was noted for its robust massiveness and its happy proportions. In the sober decoration of the external façade, the gate of Borgerhout (Fig. 24) strongly resembled that of Berchem; it was, moreover, designed by the same artist and executed by the same constructor. The façade toward the city, reproduced here, was not executed until 1583; it commemorated the attempt made by the Duke of Alençon to take possession of Antwerp. The first exhibits the severe and powerful type of a fortification-gate, while the second is rather a triumphal arch. It was originally surmounted by a pyramid covered with slate and lead. The 15th of April, 1624, the Porte de l'Escaut was also formally inaugurated at Antwerp. It is a monumental gate on the bank of the river, designed by Rubens and surmounted, on the side toward the city, by a large escutcheon held aloft by two enormous lions; on the external façade is a colossal figure of the Scheldt sculptured in bas-relief. All this ornamentation is by Quellin, an eminent artist of Antwerp, among whose many remarkable productions we may cite the decorations of the town-hall at Amsterdam. Unquestionably the greatest merit of this work lies in the dispositions of the fireplaces and in the bas-reliefs, statues and caryatides; and it was due to the colaboration of Quellin's sinewy sketching-chisel that Van Kampen, the architect of this monument on the Dam, gained his success.

After Van Kampen, an honorable place among the artists of the Netherlandish Renaissance must be assigned to Hendrick de Keyser. He excelled in what may be termed the Dutch style, specimens of which are found in all the pictures of city interiors by the small Dutch masters of the eighteenth century.

We come now to the Borromean architecture, thanks to the impetuous talent of Rubens, who put the stamp of his genius upon it and exercised such a potent spell over his contemporaries that he created in the Low Countries the style bearing his name, which is none other than that of the second period of the Renaissance, with massive proportions, strongly-marked projections and exuberant forms harmonizing with the character of the Flemish master's paintings. The chief architects of this period were Jacques Francquart, Wenceslas Kouberger, Fay d'herbe, and Fathers d'Aguillon and Hésius. Numerous great churches were erected, the most noteworthy of which are those of the convents of Beguines at Brussels and at Mechlin, the Church of Saint-Michel at Louvain, that of the Premonstrants at Grimberghen, and the magnificent church of the

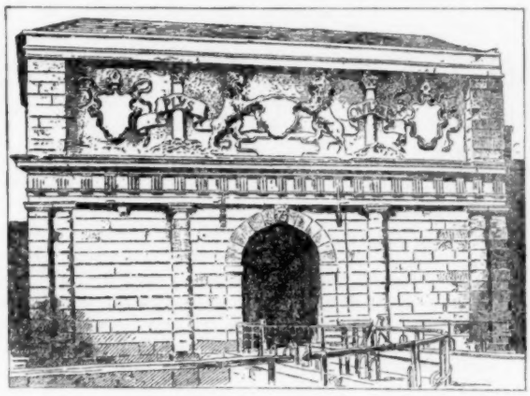


Fig. 23. The Berchem Gate at Antwerp, now demolished.

Jesuits, at Antwerp, the finest Jesuit edifice ever reared in Europe. Thirty Doric columns of Carrara marble, bearing as many Ionic columns, adorned the interior, which was disposed in the form of the ancient Roman basilica; the ceilings were enriched with paintings by Rubens, and the most precious marbles embellished the apse of the choir and the two lateral chapels.

The Church of Saint-Loup, built at Namur in 1653, is equally noted for the sumptuousness of the materials employed. The aisles are divided by twelve Doric columns of red marble; above the entablature surmounting the semicircular arches joining these are stone vaults covered with ornamental sculptures of wonderful richness; and the apse of the choir is revetted with porphyry and precious marbles. Monumental

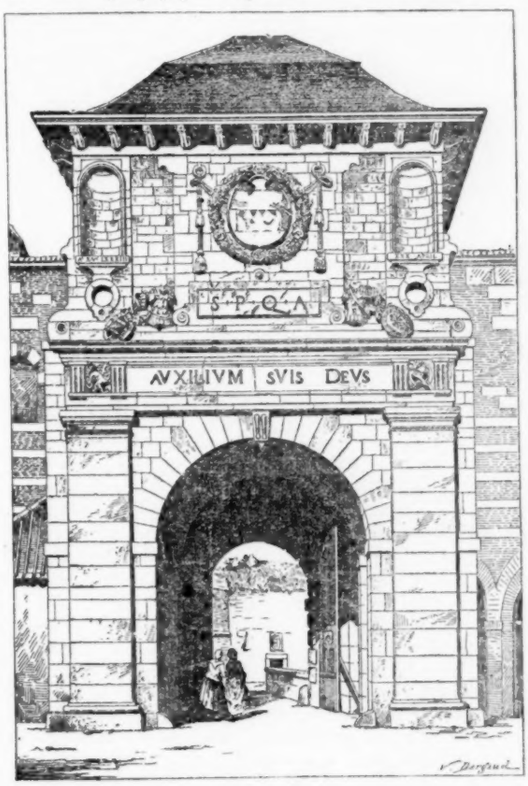


Fig. 24. The Borgerhout Gate at Antwerp, now demolished.

constructions sprang up everywhere under the impulse given by the disciples of Loyola, and outside of Italy there is probably no other country which presents such a large number of remarkable churches on such a limited area.

[1] From the French of J. van Ysendyck, in Planat's *Encyclopédie de l'Architecture et de la Construction.* Continued from No. 900, page 180.

The eighteenth century also witnessed the erection of a few temples, but they were less important, both as to size and artistic merit; they were mostly by the architect Dewez; many of them were demolished or devastated in 1793.

Aside from private residences and a few small edifices erected by the municipalities of Brussels, Antwerp, Ghent, Liège, Dordrecht, the Hague, Amsterdam, etc., no really monumental production can be cited except the vast work executed at Brussels, after the designs of Guimard; this architect was invited merely to furnish a plan for a palace to replace one that had been destroyed by fire, but he designed an entirely new quarter of the city, comprising the Place Royale, the Park, and the Rue de la Loi. The plans were received with such enthusiasm that neither the magnitude of the undertaking nor the enormous expenditure involved interfered with their execution.

The Place Royale, a large rectangle symmetrically decorated, having the church of Saint-Jacques-sur-Caudenberg for a central point, comprises eight pavilions, connected at the angles of the square by triple-arched triumphal gates; the Park laid out by Zinner, a contemporary and collaborator of Guimard, on the site of the garden of the Dukes of Brabant, constitutes, with the structures around it, a most wonderful architectural *ensemble;* but it is especially in the combination of the façades toward the Park, along the Rue de la Loi, that the decorative genius of Guimard appears in all its glory; he succeeded in taking advantage of the slope of the street to group and vary the masses, separating them by vacant spaces that form a fine setting for them. The variety and contrasts produce the

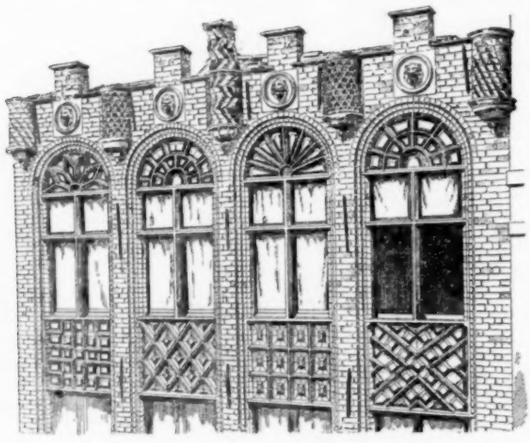


Fig. 25. Imbrications on a House at Bruges.

noblest possible effects; in the Rue Royale, a balustrade runs along the open spaces, from which a splendid panoramic view of the town is obtained; in the Rue de la Loi, one-storied pavilions connect the six great edifices symmetrically spaced along a distance of 1,150 feet; at the centre is a broad court at the rear of which stands the palace erected from plans by Guimard and intended for the Council of Brabant, but now occupied by the two Belgian Chambers. The façade of Saint-Jacques, which, as we have said, was to complete Guimard's design for the Place Royale, was erected in 1776; the construction of the body of the church was not undertaken until 1785; the work was under the direction of Montoyer, the court architect; after that date scarcely any important work was executed down to the revolution of 1830, which, freeing worship of all fetters, opened a new field to art in general and to religious architecture in particular.

In closing this study of the architecture of the Low Countries during the sixteenth, seventeenth and eighteenth centuries, we will add that, during this period, brick continued to be in common use in the Dutch provinces and especially on the Belgian littoral and in Flanders; it was employed there for the projecting mouldings, as well as for the ornamentation of the façades; and the quality is so superior that the finest specimens of decoration have come down to us perfectly preserved. At Bruges, where this material is in such general use, we find a fragment of a façade in the Rue du Vieux-Bourg (Fig. 25) dating from 1564. At Ypres and at Furnes (Fig. 26), there are richly ornamented gables in which stone is wholly wanting; there are also perfectly preserved façades in these sections belonging to the time of Louis XVI, with beautiful mouldings, garlands, fruits and flowers of most delicate workmanship, sculptured in brick, the only material furnished by the soil. Before passing to a study of the Belgian and Dutch works of the modern period, let us call attention to the popularity that

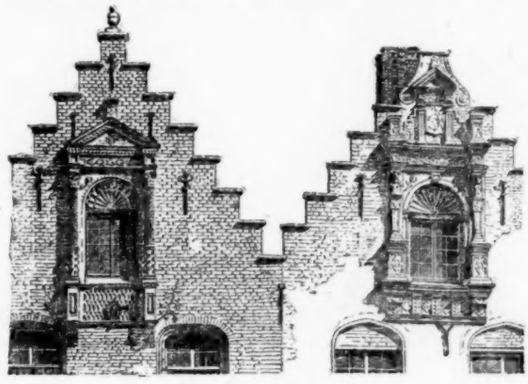


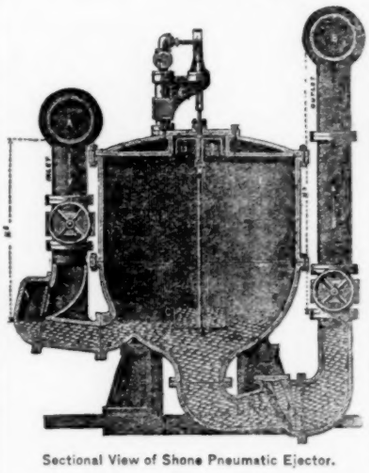
Fig. 26. Windows at Furnes.

the artists of the Low Countries had acquired throughout Europe; we may note as their principal achievements of the fourteenth century, Moses's Well, the portal of the Chartreuse, the tomb of Philip the Bold and the reredos of the dukes of Burgundy and Dijon; of the sixteenth century, at the church of Brou, the tombs of Margaret of Austria, of Philibert le Beau, of Margaret of Bourbon and the Chapel of the Virgin; and the façade of the cathedral of Toledo, of the fifteenth century.

During the Renaissance, it was a Flemish artist who executed, at Bologna, the fountain of Neptune, at Innspruck, the tomb of Maximilian, a part of the façade of Heidelberg, the tombs of the kings of Bohemia, at Prague, those of Frederick II and Christian II, the tomb of Louis V of Bavaria, that of the doge Pesaro, at Venice, and so many other decorations that bear the impress of their genius.

[To be continued.]

THE SHONE HYDRO-PNEUMATIC SYSTEM OF SEWERAGE.[1]



Sectional View of Shone Pneumatic Ejector.

THE Shone hydro-pneumatic system of sewerage was invented by Mr. Isaac Shone, civil engineer, of Westminster, England, in 1878, and the first works on this system were executed in the year 1880, at Eastbourne, England. Since that date works upon the Shone system have been carried out in the United States, Europe, India and South America, involving an expenditure of several millions of dollars; which fact may be taken as *prima facie* evidence of the soundness of the principles upon which it is based, and the durability and reliability of the mechanical details of the apparatus employed.

Wherever natural gravitation can be employed to give a reasonably perfect system of sewerage, it is unquestionably the proper means to adopt; but not infrequently, upon the score of economy, this natural force is stretched to such limits that an imperfect and insanitary method of discharging the liquid wastes of a city is the result.

The Shone system is applicable wherever the sewage of a city, district or building has, for any cause, to be raised by mechanical means, and may be applied successfully in any of the following cases:

1. Where there is no natural outlet.
2. Where the natural surface of the ground is so level that it is

[1] Extracts from a paper by Urban H. Broughton, Esq., read December 21, 1892, before the American Society of Civil Engineers and published in the "*Transactions*" of that Society.

impracticable to construct self-cleansing sewers at grades above the natural outlet.

3. Where sewers if laid at self-cleansing grades, and proportioned to the normal volume flowing through them, would have to be laid at such depths as to be prohibitive in point of cost.

4. In undulating districts containing several natural drainage-areas, where deep and expensive cuttings or tunnels would be necessary if natural gravitation was employed.

5. In low-lying basins or flat districts from which it is not practicable to convey the sewage to the main gravitation system employed.

6. In asylums, barracks and large buildings, from which the liquid wastes cannot be discharged by gravitation.

7. For discharging sewage sludge.

The Shone system may briefly be described as one in which the motive power, viz, compressed air, is generated at one central power-plant and distributed to numerous pumping-stations. Each station is the outfall of the district tributary to it. The sewage from the various stations is automatically discharged into one common discharge leading to one common outlet.

In the use of this system the first step is to divide the territory under consideration into as many drainage-areas as desirable; the extent and boundaries of each being determined, either by the contour of the ground, density of population or by other causes. The drainage-areas being defined, the lowest point in each is located; or, in the case of absolutely level ground, the central or most convenient point is determined. Here, at what is termed an "Ejector Station," all the sewers of the district are centred; these can be of the exact size to accommodate the maximum population of the district, and laid at such grades as to carry the sewage to the ejector-station as rapidly as it is discharged from the houses and before decomposition sets in. In the ejector-station a pneumatic ejector (described hereafter) is placed. As fast as the sewage flows into and fills the ejector compressed air is automatically admitted, forcing the sewage into a sealed iron main through which it is conveyed rapidly, under pressure, to the outfall or into a high-level gravitation-sewer.

The ejector-chamber is a man-hole-like chamber, built beneath the surface of the street or elsewhere, having an ordinary man-hole cover on top.

The division of a city into separate areas for the purpose of sewerage was first mooted as far back as the time when the best method of sewering London was under discussion. Sir Edwin Chadwick then advocated the dividing of the whole site into natural drainage-areas, and the employment of an independent pumping-station in each division. It rested, however, with Mr. Shone to devise the means of carrying out this idea in a practical and economical manner.

The advantages of dividing a city into sewerage districts are many, among which the following may be mentioned:

Self-cleansing sewers from houses to outfall, with sewer-pipes of small diameter.

The severance of each district from the rest of the drainage-area, so that in the event of an epidemic disease breaking out in one district it cannot be conveyed by the sewers into healthy districts.

The amount of water required for flushing and the volume of air required for ventilation are, by reason of the small diameter of the sewers and the comparatively short lengths tributary to an outfall, reduced to a minimum.

The avoidance of deep cuttings.

The ready extension of the system as necessity demands.

If these advantages could only be obtained by separate and independent pumping-stations, each with its own staff of attendants, the annual maintenance charges would be prohibitive; but by the Shone system, as already described, any number of stations can be worked from one central power-plant.

In connection with the division of a city into districts for the purpose of applying the Shone system, it should be stated that the consumption of compressed air would not be appreciably increased by reason of multiplying the number of divisions. From one compressing-station a number of ejector-stations can, in most cases, be supplied more economically (in fuel cost) than if the whole of the sewage were brought to one spot and thence raised to the same outfall; because a considerable amount of the sewage would be intercepted at higher points, and thus effect a saving in the work to be done. To apply an ordinary steam sewage-pump it would be necessary to allow the whole of the sewage to gravitate to the lowest point, so that any advantage in the duty of the engine itself would be more than counterbalanced by the increased work it has to do, through so large a proportion of the sewage having to run down merely to be pumped up again.

The preceding figure is a sectional view of a Shone Pneumatic Ejector of ordinary construction. The action of the apparatus is as follows:

The sewage gravitates from the sewers through the inlet-pipe *A* into the ejector and gradually rises therein until it reaches the underside of the bell *D*. The air at atmospheric pressure inside this bell is then inclosed and the sewage continuing to rise around it, its buoyancy is sufficient to lift it with the spindle, etc., and to open the compressed-air admission-valve *E*. The compressed air thus automatically admitted into the ejector presses on the surface of the sewage, driving the whole of the contents before it through the bell-mouthed opening at the bottom, and through the outlet-pipe *B*, into the iron sewage-discharge-pipe, or high-level gravitation-sewer, as the case may be. The sewage can only escape from the ejector by the outlet-pipe, as the instant the air-pressure is admitted upon the surface of the sewage the valve on the inlet-pipe *A* falls on its seat and prevents the fluid escaping in that direction.

The sewage passes out of the ejector until its level falls to such a point that the weight of the sewage retained in the cup *C*, which is no longer supported, is sufficient to pull down the bell and spindle, thereby reversing the compressed-air admission-valve, which first cuts off the supply of compressed air to the ejector, and then allows the air within the ejector to exhaust down to atmospheric pressure. The outlet-valve then falls on its seat, retaining the liquid in the sewage discharge-main; and the sewage flows through the inlet once more, and so the action goes on as long as there is sewage to flow.

The position of the cup and bell is so adjusted that the compressed air is not admitted to the ejector until it is full of sewage, and the air is not allowed to exhaust until the ejector is emptied down to the discharge level; thus the ejector discharges a specific quantity each time it operates.

The advantages of this apparatus may be summed up as follows:

1. The working parts are reduced to a minimum, and these are of a kind not likely to get out of order.

2. The parts into which the sewage enters contain no finished surfaces, such as are unavoidable in pumps and are rapidly destroyed by the action of the sewage-sludge and grit from road detritus, etc. In the ejector there is nothing but the hard skin of the castings, coated with a composition upon which the sewage can produce no detrimental effect.

3. The friction of a pump-piston and other working parts is avoided; the compressed air itself, acting directly upon the fluid without the intervention of any machinery, forms an almost absolutely frictionless and perfect air-piston, past which there can be no slip or leakage whatever.

4. The only finished parts are those in connection with the small automatic air-valve, which makes only one movement of two or three inches for each discharge of the ejector or from 50 to 1,000 gallons (according to the size of the ejector), and they are in contact with the compressed air only, and out of the reach of the sewage.

5. The sewage-inlet and outlet-valves are so arranged as to give a passage-way of the full area of the pipe, allowing a free passage to all the solids that the sewer itself can carry.

6. The outlet is from the bottom of the ejector, so that the whole of the sewage, including solids, sludge, grit and everything brought down the sewer, is discharged out of the ejector.

7. No screening or straining of the sewage is necessary, as is the case with pumps, and the nuisance caused by the cleaning of the pump-gratings and sump-wells is avoided.

8. The sudden rush of the whole contents of the ejector, when the discharge is into a gravitation-sewer, forms a most effective flush.

9. The ejector forms an absolute severance of the house-drains of each district from the main sewer, and it automatically works either slowly or rapidly according to the flow of sewage.

The Shone system has been applied with advantage to sewerage-works upon the "combined system"; but, in the author's opinion, greater benefit can be obtained when it is applied in connection with the "separate system"; as in many cases, owing to the flatness of surface-grades, it is impossible, upon the gravitation system, to obtain the fall necessary for small pipe-sewers without carrying them down to excessive and prohibitive depths. The primary essential to a good system of sewers is that they should be laid at grades which will be self-cleansing when the normal flow of sewage is passing through them, and the *raison d'être* of the Shone system is to admit of this being obtained at a permissible cost regardless of natural adverse conditions.

Some engineers who have not understood the Shone system have treated it as if it was a competitor of the steam-pump in the lifting of sewage, and have decried compressed air as a wasteful method. The primary object of the system is to get as high a degree of sanitary efficiency in connection with the every-day working of house-drains and sewers as is possible, and, if it accomplishes this, the question of the relative efficiency of steam-pumps and ejectors is of secondary importance. . . .

The Shone system is in practical operation for the sewerage, either wholly or partially, of twenty-four towns in England; at Rangoon, Burma; Campos and Rio de Janeiro, Brazil. It has also been applied for the drainage of the public slaughter-houses of Moscow, Russia, and for the Houses of Parliament and other large buildings in London. A description of most of these works has appeared in engineering journals and elsewhere, so the author will confine himself to what has been done on this system in the United States.

Many large buildings in cities, such as hotels, office-buildings, etc., require, for economical as well as other reasons, to have basements in which boilers, pumps, electrical and other machinery, as well as sanitary fixtures, may be placed; and it frequently occurs in cities in which the public sewers are shallow, that it becomes necessary, in order to obtain sufficient head-room in the basement, to construct the floor at about the same level as, or below, that of the street-sewer. It is then of vital importance to remove all liquid wastes expeditiously, sanitarily, and in a reliable manner from the building to the street-sewer.

The Shone ejector has been found to serve this purpose effectually. In a chamber underneath the floor of the basement a small ejector is placed at such a level that all the basement sewers and drains of

the building may have a good fall to it; these sewers and drains deliver sewage, drips from engines, washings from boilers and ground-water to the ejector, from which, when full, the contents are discharged into the street-sewer.

To work the ejector, a small vertical direct-acting compressor is employed, which is bolted to a wall in a convenient place in the engine-room of the building, and the compressed air is conveyed to the ejector through a wrought-iron pipe of small diameter. When steam is turned on to the compressor the whole apparatus is automatic. The compressor delivers air into a receiver, and when the required pressure is attained (usually about eight pounds) the compressor stops, automatically starting up again when the pressure of air is reduced in the receiver, by reason of the discharge of the ejector.

The ejector not only discharges the liquid wastes from the building as rapidly as created, but forms an absolute barrier against a reverse flow of sewage or sewer-gas from the street-sewer. It is preferable to place these ejectors in duplicate, one for constant service and one in reserve. The author has, however, knowledge of a single ejector which has worked continuously day and night in a building in Chicago for two and one-half years without a single stoppage for any cause. For the above-described purpose, there are twenty-four Shone ejector-plants now in operation in this country, the majority of them being in Chicago. . . .

The largest installation on the Shone system in this country is at the World's Columbian Exposition, Chicago. The site is Jackson Park, lying on the shore of Lake Michigan, and contains rather more than 600 acres. The buildings provided for the purposes of the exhibition are sixteen in number, and vary in size from one to thirty-two acres each; in addition there are forty or more buildings of smaller size, built by individual States and foreign governments, which bring the total roof-area up to about 150 acres.

A daily attendance of 150,000, with a possible maximum of 400,000, is anticipated. For the accommodation and convenience of this multitude there will be provided in the Exposition buildings twenty-five or thirty cafés or restaurants, of an average area of 5,000 to 6,000 square feet each, with public and private dining-rooms. There are also in these buildings toilet-rooms and lavatories, containing a total of 3,000 water-closets, and urinals and wash-basins in proportion. In addition there are toilet-rooms with water-closets, etc., in the forty or more buildings of the States and Governments. As the site is very flat, varying from five to eleven feet above Lake Michigan, any system of collection of sewage by gravitation-sewers alone would necessitate very light grades; it was therefore decided to put in a separate system of sewers for the removal of the sewage proper, and to pump the sewage to purification-works situated in the southeast corner of the grounds. Mr. W. S. MacHarg, chief-engineer of water, sewerage and fire-protection, having had practical experience of the working of the Shone system in Chicago, recommended its employment for the removal of the sewage of the entire area.

Over the area of the grounds twenty-six ejector-stations are located, the majority of them underneath the floors of the buildings, some underneath grass swards, and others underneath roadways. In each station two ejectors are placed, varying in capacity from 60 to 600 gallons each per minute, and having a united discharging capacity of 17,000,000 gallons per twenty-four hours. This is a larger plant than would be required for the removal of the sewage of any city in the United States, with probably ten exceptions.

Converging to these ejector-stations are three miles of gravitation main sewers, the minimum grade adopted being one in 250. The vitrified sewer-pipes are laid in two-and-one-half-foot lengths, and have extra-deep sockets in order that water-tight joints may be insured; inside the buildings the sewers are of iron.

The air-compressing plant for operating the ejectors was designed and built and is placed as an exhibit in the Machinery Hall by the Norwalk Iron Works Company, of South Norwalk, Conn. It consists of three compound air-compressors, and one double compound air-compressor, the principal dimensions of which are as follows:

	Diameter of air-cylinder.	Length of stroke.	Diameter of steam-cylinder.	Diameter of compressing-cylinder.
One compound compressor....	26″	30″	24″	17½″
Two compound compressors...	22″	24″	20″	13½″

One double compound compressor, diameter of air-cylinder, sixteen inches; length of stroke, sixteen inches; diameter of compressing-cylinder, nine and one-half inches; diameter of high-pressure steam-cylinder, ten inches; diameter of low-pressure steam-cylinder, sixteen inches.

The distinctive features of these air-compressors are that they have two air-cylinders with cooling-chamber between. A large air-cylinder is employed to make the initial, and a small cylinder the final, compression. By such an arrangement a more nearly uniform resistance for the whole stroke is obtained.

The air is admitted to the large cylinder by valves of the Corliss steam-engine pattern, which have positive movement from the main shaft. The air is partially compressed in the large cylinder and forced thence into the small one through a chamber filled with copper pipes, through which cold water circulates. In the small cylinder the air is compressed to the extent desired. Both inlet and outlet valves can be taken out without removing a cylinder-head. The piston-rings can also be taken out without removing the piston from the cylinder. Both air-cylinders are surrounded by water-jackets.

The steam and air pistons and cross-head are mounted on the same piston-rod, so as to render the application of power uniform. Two fly-wheels are used, one on each side of the machines, and, by means of a swivel in the centre of the cross-head, the work is made exactly equal upon both connecting-rods. The steam cut-off is changed by turning a hand-wheel at the back end of the valve-chest.

The plant has a capacity of 4,537 cubic feet of free air per minute. Leading from the central plant is a system of air-pipes five miles in length, varying in diameter from two to ten inches. The air-pipe outside the buildings is ordinary cast-iron water-pipe laid with lead joints, with an average depth of covering of four and one-half feet. Inside the building it is of wrought-iron with screw joints. This pipe-line was tested to withstand ninety pounds pressure per square inch without any appreciable loss. From the ejectors to the purification-works is a system of cast-iron sewage discharge-pipes 4.8 miles in length, varying in diameter from six to thirty inches.

The maximum direct lift from the discharging-level of the lowest ejectors to the top of the sewage receiving-tanks is 67.62 feet; and the total head to be pumped against when the maximum estimated amount of sewage is being discharged is 107.87 feet. The air in the air-mains will be maintained at a pressure of forty-seven pounds to the square inch, and supplied to each ejector-station through reducing valves at the exact pressure required at each station.

The sewage receiving-tanks, four in number, are constructed of steel plates riveted together. Each tank is thirty-two feet in diameter and fifty-five feet high, the bottom, twenty-two feet, being in the form of a cone. This design of tank was first used at Dortmund, Germany, by Herr Carl Kinebuhler.

After the sewage has received its precipitating agent, it flows through a large tube fixed vertically in the centre of the tank to a depth of about thirty feet, where, by means of radial arms, it is distributed over the area of the tank and slowly rises to the top. The heavier matter settles gradually to the bottom of the tank as sludge, and in the process of doing so acts as a filter for the rising sewage. It is claimed that by means of this mechanical operation the chemicals are utilized to their full advantage. The effluent water overflows at the top of the tank and will be conveyed to Lake Michigan, while the sludge will be pressed into cakes and burned. This form of tank takes up very little space. The tanks, mixing-vats, engines, boilers and sludge-presses are contained in a building 100 x 125 feet. For economical reasons it was deemed advisable to build the tanks above the surface of the ground.

The works are nearly completed and a section of them was put into operation during the dedication ceremonies in October last, for the convenience of an attendance estimated at two hundred thousand.

AMERICAN ETHNOLOGY AT THE WORLD'S FAIR.

Greyfriars' Church, Ysted, Sweden.

SOUTH of the United States, the Bureau of Latin-American Republics in connection with the State Department has been working with the Ethnological Department of the Exposition, of which it forms a section, and a number of officers of the army and navy were detailed to visit the various republics and arouse an interest in the Exposition, and also to make collections in ethnology and archæology under instructions which I furnished for their guidance. These gentlemen have accomplished much of ethnological importance, and have secured several collections from the native peoples of Central and South America. Mr. Frederic Ober was

[1] Extracts from the report of the Peabody Museum of American Archæology and Ethnology.

sent to the West Indies and made a special research among the Caribs.

In relation to Mexican archæology, Mrs. Zelia Nuttall, acting in her double capacity as honorary assistant in the Museum and in the Ethnological Department of the Exposition, has been engaged in a search for objects in Europe, brought there at the time of the Spanish Conquest, and has found several interesting things, connected with the period of Cortez, of which she has had fac-similes made both for the Exposition and for the Museum.

Farther south in Mexico, Consul E. H. Thompson has continued the work in connection with his explorations for the Museum among the ancient ruins of Yucatan. During this time he has made about 10,000 square feet of moulds of portions of the ruined buildings, showing the façades, parts of corners of structures, doorways, and the great recess with its pointed arch of the so-named "House of the Governor," at Uxmal. He has also moulded both sides of the famous Portal at Labna. Casts are to be made from these moulds in Chicago, and this year there will be seen on the Exposition grounds fac-similes of these portions of the elaborately carved stone structures of Yucatan, over and around which will be the tropical plants native to the region of the ruins. As this work by Mr. Thompson was in connection with his explorations for the Museum, we can secure such casts from the moulds as we may desire at the cost of making the casts, which, however, will be several thousand dollars.

The Museum Expedition to Honduras, which is an important part of the work of the year, will be specially mentioned further on, but as it forms a link in the chain of explorations it is referred to in this geographical review. Farther south, Mr. G. A. Dorsey, a graduate student in this department of the University, working as a special assistant for the Exposition, has made extensive and important explorations on the Island of La Plata, Ecuador, and in Peru and Bolivia, where he collected a large amount of material. Lieutenants Safford and Welles have secured series of garments, weapons and other objects illustrating the tribes of portions of the interior of South America. Other officers sent out by the Latin-American Bureau have been farther south, and Patagonia and Terra del Fuego have been drawn upon for representations of their ethnology.

Returning to the United States, archæological work has been carried on in Ohio by Doctor Metz, Mr. Saville, Mr. Moorehead, Mr. H. I. Smith and Mr. Allan Cook. In the Delaware valley, Mr. Ernest Volk, who in previous years was in the field with me, has been engaged in making a careful exploration of several ancient village sites, burial-places, and workshops or quarries where stone implements were made. Mr. Allan Cook of the University also made a brief study of a small burial-place on Cape Cod. Mr. M. H. Saville, a student assistant in the Museum, examined an ancient soapstone-quarry in Connecticut from which interesting specimens were obtained both for the Museum and Exposition; and several gentlemen, particularly Dr. F. H. Williams, Mr. Wm. C. Richards and Mr. James Shepard, who showed him much courtesy, gave to the Museum a number of stone implements found on and near the old quarry. In Maine, Mr. C. C. Willoughby, working entirely for the Museum, explored two singular burial-places in the Androscoggin valley in which the graves were so old that the skeletons had entirely disappeared, leaving in the graves only masses of red ochre and numerous implements and other objects of stone. This exploration was conducted in a careful manner, and the notes, drawings and photographs of the objects in place show how thoroughly the work was done. A fine lot of implements in perfect condition was found by Mr. Willoughby, and several others obtained in former years from the same place were given to the Museum by Mr. Elijah Emerson of Bucksport. This remarkable collection will be exhibited in Chicago as part of the Peabody Museum exhibit and will afterwards be arranged in the Museum. At the request of Mr. T. H. B. Pierce, of Dexter, Me., Mr. Willoughby also made a partial examination of a mound near Dexter which may be a burial-mound. Further exploration should be made, for if it prove to be a burial-mound it would be the only one known in New England.

The Serpent-mound Park. — Ever since the Serpent Mound became the property of the Museum, by the generosity of some of its friends, it has been my purpose to construct a perfect model of the Serpent-mound Park. The plans and moulds for this purpose have been gradually developed during the past few years and at last a beautiful model in papier-maché has been made. This model includes the whole park of seventy-five acres as it now is with driveways, paths, groves, etc., and shows the ancient earthworks, burial-sites, etc., in their relative positions. This is all accurately represented in a horizontal scale of thirty-seven and one-half feet to an inch, and a vertical scale of twelve and one-half feet to the inch, from a survey by Mr. C. Cowen, who made a plaster model in the Museum under my direction. From this model a mould was taken by the Ward Company of Rochester, who cast the work in papier-maché and finished it in all its details in a thorough and artistic manner. By studying this model one obtains a comprehensive impression of this singular earthwork and its surroundings, which plans and photographs fail to give. It is a good evidence of the necessity of such models as objects of study in a museum. A copy of this model has been made for the Columbian Exposition, and I am now having made similar models of other noted earthworks in the Ohio valley, copies of which could be secured for the Museum if we had the means to pay for the casting and finishing.

The Honduras Expedition. — It was stated in the last report that an expedition had just started to make the preliminary explorations of the ancient ruins of Copan, and in that report is given a brief outline of the origin and plans of this undertaking on the part of the Museum to be carried on by the assistance of patrons of archæological research. It is indeed a pleasurable duty to announce that the first season's work of the expedition has proved a decided success, and that, although the party had many trials and difficulties to overcome, no serious accidents or sickness occurred. Messrs. Saville and Owens returned in safety, in May last, bringing with them a large number of most interesting and important objects illustrating the wonderful carvings in stone, several vessels and many fragments of pottery, numerous ornaments made of stone, shells and bone, stone implements, and portions of human skeletons. Among the latter are several incisor teeth, each of which contains a small piece of green stone, presumably jadeite, set in a cavity drilled on the front surface of the tooth. We had before received from very ancient graves in Yucatan human teeth filed in a peculiar manner, and now we have teeth from the ancient graves in Copan ornamented in another way. This is of particular interest in adding one more to the several facts pointing to Asiatic arts and customs as the origin of those of the early peoples of Central America. A most striking resemblance to Asiatic art is noticed in several of the heads carved in stone, — one in particular, if seen in any collection and not labelled as to its origin, would probably pass almost unchallenged as from Southern Asia. These may prove to be simply coincidences of expression of peoples of corresponding mental development brought about by corresponding natural surroundings and conditions. At present we must admit that there are many resemblances in architecture, sculpture, ornament and religious symbolism between Central America and portions of Asia. The true meaning of these resemblances will be made known, as authentic materials for study are obtained by such thorough and exhaustive field-work as the Museum has been carrying on; and none is so important for this special subject as that of the Honduras Expedition. For this work, however, a large sum of money is required. The ten years allowed for the work in Honduras by the edict of that government must be utilized to the fullest extent; and each year must find the Museum ready to put its party in the field well equipped and provided with money for the very expensive work to be performed.

It is not my intention to give an abstract of the results of last year's explorations at Copan. It is far better that the report should be carefully prepared by those engaged in the actual field-work from year to year. After sufficient information has been obtained about the ruins themselves, and the architectural and chronological relationship of the various structures, and after a thorough knowledge of the different modes of burial has been acquired, and all possible objects have been collected, then conclusions can be drawn which will be of scientific value, since they will be based on a thorough knowledge of all the facts. An important beginning was made by the expedition last year, plans of the plaza and of the principal structures forming the great mass of the ruins having been made, many photographs taken, and paper moulds of important sculptures, lines of hieroglyphs and several of the large idols or carved monoliths secured. Considering the difficulties of transportation (wholly by mules to the coast, — a seven days' journey), both Messrs. Saville and Owens, and all associated with them, must be congratulated on what they accomplished. Since the return of the expedition the photographs have been printed, preliminary reports have been prepared, and casts have been made from the moulds. These casts are now being placed in the Museum, and a series has also been made for the Boston Art Museum, and another for the Columbian Exposition.

It is a pleasure to state that the party received much kindly aid from the enlightened citizens with whom they were brought in contact, particularly from Mr. and Mrs. Potts at Yzabal, whose kind attentions proved most opportune, as the yellow-fever was prevalent at that port at the time of the return of the party. Mr. Anderson, our consul at Livingston, also extended assistance and courtesies, and the government officials of the district were polite to the party. The reverend bishop of Copan was an interested visitor to the camp, and his intelligent appreciation of the work was most encouraging.

The East River Gas Company's Tunnel. — The tunnel now being constructed under the East River, by the East River Gas Company, is 8 x 10 feet, and is to be about one-half mile long when completed. The headings are now about 500 feet from the New York side, toward Blackwell's Island, and 100 feet out from the shaft on the Long Island side. Compressed air is being used to hold back the water, and as the New York end is 134 feet and the Long Island end 147 feet below mean low tide, the pressure is correspondingly severe. It is, in fact, the greatest depth at which air-pressure has been used in work of this description, to the best of our knowledge. The men work in four-hour shifts; but one foreman is said to have already died from the effect of the great air-pressure, and three of the workmen were taken out unconscious on March 10, and are in the hospital in a dangerous condition. The tunnel is being built to carry one 48-inch and two 30-inch gas-mains from the Long Island City works to New York, landing at the foot of 71st Street. The material being tunnelled is a hard gneiss rock, and the use of compressed air was not contemplated originally, as the borings indicated a very compact material. — *Engineering News.*

COMPARATIVE MUNICIPAL BUILDING LAWS. — XXV.

[*Note:* — In these tables bracketed letters invariably refer to preceding passages in the same column.]

Signs, Awnings (see "Sidewalks"), Fences.

Boston: — Fence or structure of that nature unnecessarily exceeding 6′ high maliciously erected or maintained is a private nuisance.

Baltimore: — *a.* Signs must not extend more than 2′ from building-line.
b. Awnings must be at least 8′ from pavement.
Brooklyn: —

Charleston: —
(*b*) and shall not project over more than three-fourths of width of sidewalk, supported without posts by iron supports firmly attached to building, covered with light, pliable material.
Chicago: — *c.* Signs placed on building above sill of third-story window shall be made of incombustible material.
d. No wooden sign more than 2′ wide.
e. No wooden fence to exceed 8′ in height above sidewalk grade, or above surface of ground where no grade is established.
No spike or other pointed instrument of any kind shall be attached to rail, guard or other protector upon stairway, entrance exterior building-line or sidewalk.

Cincinnati: —
Cleveland: —
Denver: —

Detroit: — No wooden sign placed on building above sills of third-story windows.
District of Columbia: — No sign or advertisement upon roof or front of building in Washington or Georgetown to project more than 3′ 6″ beyond building-line.
No fence less than 5′ nor more than 7′ high except with consent of both parties and approval of Inspector.
Awnings and frames shall be of iron, firmly secured to building. Posts set in stone or iron blocks 6″ within outer line of curb. *On parked streets* awning may extend to curb, but not to exceed 15′ from building-line. (*b*).
Kansas City: —
Louisville: — (*c*); (*d*).

Memphis: —
Milwaukee: —
Minneapolis: — (*c*); (*d*). Awnings attached to buildings to have iron frames.
Nashville: — No wooden fences more than 7′ above ground. No wood or iron awnings over sidewalk.
Newark: —

New Orleans: —
New York: — (*d*). Wooden fences shall not exceed 10′ high.
Omaha: — (*c*). Signs shall be fastened securely to and close against wall.
No sign to project over sidewalk to exceed 4′.
No sign upon cornice on roof unless by order of City Council.
Philadelphia: — *Partition fences in rural districts* at least 4′ 6″ high; *in other districts* at least 6′ 0″ high.
Pittsburgh: —
Providence: —

St. Louis: — Sign constructed on top or street front of building, when over 3′ high shall be constructed of sheet-metal. *Within district bounded by Washington Avenue, Walnut Street, the river and Fourteenth Street,* no stationary awnings permitted.

San Francisco: — No sign on front, rear or side of building higher than its blocking-course or fire-wall.
No sign of wood, canvas or cloth to exceed 3′ in height.
All signs securely bolted to building.
No framework placed above roof and covered with inflammable material.
Fence-walls not less than 12″ thick for height of 8′ and increased 4″ in thickness for every 4′ or part thereof additional height.
Awning, shade or balcony securely supported on iron brackets built into wall and without posts, and not less than 11′ above curb-level, and gutter formed to carry water to line of building and thence to street-gutter. (Gutter not required on cloth or canvas.)
Movable canvas awnings or shades not less than 7′ 6″ above curb-level. No awning, shade or balcony to extend over curb, nor inclosed to height greater than 3′ 6″, nor erected on building facing street less than 20′ wide, nor on sides or rear of building unless there is at least 30′ clear space between buildings, and then constructed of fireproof material.
Wilmington: —

Explosive or Inflammable Contents.

Boston: — *a.* No explosive or inflammable compound or combustible material shall be stored or placed under stairway of building, or
b. Used in place or manner to obstruct or render egress hazardous in case of fire.
c. No building used in any part for storage or sale of hay, straw, hemp, flax, shavings, burning-fluid, turpentine, camphene, or inflammable oil or highly combustible substances shall be occupied in any part as dwelling, tenement or lodging house.
d. (*Exception:* Upon special permit from Inspector, rooms for coachman or groom may be allowed in private stables.)
e. Receptacles for ashes, waste and other substances liable by spontaneous combustion or otherwise to cause fire, shall be of incombustible material satisfactory to Inspector.
Baltimore: — (*a*).

Brooklyn: — Ash holes or houses shall be built of brick and stone, without wood in any part.
f. No building occupied in whole or part as dwelling shall have any hay, straw, hemp, flax, burning fluid, turpentine or other combustible material stored therein, or kept on sale except in such quantities as shall be provided by law or ordinance.
Charleston: —

Chicago: — *g. Buildings designed for storage of petroleum or articles of like nature* shall be constructed as follows: Walls, minimum thickness 16″, maximum height 16′; floors of fireproof paving or concrete, upon ground, which shall be at least 2′ below street grade; roofs of metal, or in best-manner composition-roofing; to have fire-walls 18″ all around, not less than 8″ thick, and copings of incombustible material.
h. Smoke-houses shall be constructed throughout of incombustible material; ventilators at or near top; guards not less than 4′ above fire-beds sufficient to prevent meats falling into fire; openings into other buildings protected by iron doors and shutters properly and thoroughly constructed.
i. Buildings used in whole or part as planing-mill, sash, door and blind or other woodworking factories, carpenter and cooper shops, wagon, carriage or agricultural-implement manufactory shall have in connection therewith brick or fireproof vault of sufficient capacity to contain all shavings and other light combustible refuse connected therewith, and removed daily to such vault.
j. No such material allowed to accumulate except in such vault.
Cincinnati: — *Buildings more than one story high when* (*i*).
Cleveland: — *Buildings more than one story high* (*i*).
Denver: — (*a*), (*c*), except rooms for coachmen and grooms in connection with private stables.
Receptacles for ashes to be built of brick, stone or other similar incombustible material satisfactory to Chief of Fire Department, and in no case allowed to overflow.
Within Inner Fire-limits, buildings used for business in which light combustible material is made shall have at each such establishment a brick or fireproof vault or furnace, in which all shavings and other light combustible material may be deposited and burned without endangering surrounding property; and all such material shall be so burned or removed from premises, and not allowed to accumulate.
The manufacture or storage of excelsior and other extra-hazardous material is prohibited in new establishment.
Detroit: — No person shall keep hay, straw, hemp or shavings without having them inclosed so as to protect them from flying sparks.
District of Columbia: — Depositories for ashes shall be built of fireproof material.

Kansas City: — (*a*); (*b*).
Louisville: — Fireproof vault shall be erected on premises of building in which manufacture of wooden articles is carried on, in which to store every day all shavings and other refuse. (*j*). Buildings designed for storage of petroleum and like substances shall be fireproof throughout, floor not less than 2′ below street grade, and walls not less than 17″ high and 8″ thick all around house.
Smoke-houses shall be constructed throughout of fireproof material. Openings therefrom into other buildings shall have iron doors.
Memphis: —
Milwaukee: — (*g*).
Minneapolis: — (*h*); (*i*); (*j*).
Nashville: — Petroleum or coal-oil shall be kept where floor is lower than street-gutter.
Newark: — Ash-holes and ash-houses within city shall be built of stone, brick or iron, without wood in any part.
New Orleans: —
New York: —
Omaha: — (*h*).

Philadelphia: —

Pittsburgh: —
Providence: — Depositories for ashes in interior of building shall be of incombustible material.
St. Louis: — *Between Washington Street and Chonteau Avenue, and between Ninth Street and Levee,* hay, cotton or hemp in bales or in bulk for bailings or for manufacture, crude petroleum, naphtha, benzine, gasoline or coal-oil, shall be stored in substantial brick or stone buildings, minimum thickness of walls 18″, roof-covering of slate, metal, or, upon buildings already erected, composition roofing.
In any part of city none of above articles kept, except in fireproof building.
Exceptions: Hay for immediate use, and hay baled in feed-stores not exceeding 500 bales, coal-oil of approved standard (110° F.), duly inspected, not exceeding ten barrels, for jobbing.
Petroleum, naphtha, benzine, gasoline, turpentine, varnish and coal-oil stored only in fireproof buildings designated by Commissioner, and have conspicuous sign on outside.

San Francisco: — Smoke-houses or dry-houses to be built of brick or stone, with doors and roof of non-combustible material.
Hay, bags, litter and other combustible waste or fragments shall, at close of each day, be securely stored or disposed of, so as to be safe from fire. Building for storage of crude petroleum or any product of petroleum must be of stone or brick, and not more than one story high.
Wilmington: —

Compiled by Henry A. Phillips.

AUSTRALIA

EMIGRATION AND IMMIGRATION. — HARD TIMES AND WAGES. — ALLIANCE OF THE INSTITUTE OF ARCHITECTS OF NEW SOUTH WALES WITH THE ROYAL INSTITUTE OF BRITISH ARCHITECTS. — RECENT FLOODS.

IN my last letter reference was made to the scheme for establishing a New Australia in South America. In the face of this, it sounds like irony to read a recent telegram announcing the arrival of an accredited agent, whose mission it is to take up sufficient land for the settlement of one thousand German families. South Australia will probably be chosen as the future home of these emigrants from the Rhineland, who are said to be principally agriculturists and *vignerons*. The fact of the matter is that Australia is far too sparsely populated, and when more people have settled on the land the more prosperous will the country become. And yet the New Australia scheme seems to have some adherents; but I suppose the crop of fools is never exhausted. It is not more than seven or eight years ago, I think, since a gaunt and famine-stricken crowd landed in Sydney — the pitiful remnant of the Marquis de Ray's ill-starred attempt at the colonization of New Britain. But undeterred by the sufferings which befell those poor deluded Italians, lured on by specious promises to abandon home and friends, many here are falling into the same trap, and are willing to leave everything in order that they may share the wealth and boundless freedom which, they are told, await them in Argentina or in Paraguay.

There can be no doubt that want of sufficient employment is causing widespread disaffection among the laboring classes throughout Australia, but most of their troubles they owe to their own shortsightedness and to the arbitrary action of the labor-unions. Depression may be rife, and hundreds of men may be clamoring for bread, but no matter how bad the times or how unremunerative the investments of the capitalist, the workman's standard wage must be maintained, say the Unions, and it must not be affected by any question of supply and demand. Some years ago, when Melbourne was experiencing a building-boom, the rate of masons' wages was raised from 10*s.* to 10*s.* 8*d* per day, and last week, in consequence of the general depression, some contractors there had the temerity to tell their men that they did not feel justified in giving more than the original amount, viz, 10*s.* The men immediately went out on strike. Sir George Dibbs told a deputation from the unemployed which waited on him some time ago, asking for work, that until the Unions recognized the fact that their rules must be made somewhat more elastic, these labor-troubles would always exist. A few years back a building-owner looked for a return of at least eight per cent on his total outlay; now he considers himself lucky if he can get five per cent. Yet the wages of those engaged in the building-trades are unaltered, though there is literally no hope of employment for at least two-thirds of them.

The latest suggestion is that the New South Wales Parliament should commit the country to the expenditure of at least half a million pounds sterling, in the erection of the long-talked-of Parliament-House, — though the treasury coffers are empty and though the buildings are not absolutely required,— in order to provide work for those whose pig-headedness and selfishness have done much to bring the country into these financial straits.

The principal event in our architectural world is the recent alliance with the Royal Institute of British Architects of the Institute of Architects of New South Wales. This is the only architectural body outside the United Kingdom on which this honor has been conferred, and it is the result, without doubt, of the unfaltering resolution and indomitable courage of the president, Mr. J. Horbury Hunt, F. R. I. B. A., who has fought against spite and apathy and ridicule for the last two years, and has won, in the teeth of apparently overwhelming odds. It is satisfactory to know that the Institute at last stands on a firm basis.

The great floods in Queensland have been most disastrous in their results. Two bridges over the Brisbane River have been carried away, and will cost hundreds of thousands of pounds to replace. Many smaller bridges in the surrounding locality have also been wrecked. In the lower portions of the Queensland metropolis the water rose to a height of thirty feet in the streets, and it is impossible to form even a rough estimate of the loss sustained by the unfortunate owners of house-property in the neighborhood. The most singular incident of the flood was the stranding of a gunboat and a coasting steamer, high and dry, on a gravel walk in the Botanical Gardens; though, as I write, it is reported that the flood-waters, which had almost subsided, are again rising, and it is probable that the two vessels may be floated off.

The most horrible account of suffering yet to hand is that of a man who was washed away, and who managed to grasp a tree, in the branches of which he was compelled to remain during the night. When rescued, the next day, it was found that he had suffered so terribly from the bites of the scorpions and centipedes, which had also sought refuge in the tree, that he died in a few hours.

PARIS

THE HEARING ON THE OPERA COMIQUE BEFORE THE SENATE. — DETAILS OF M. GUILLOTIN'S REJECTED SCHEME. — DEATH OF P. V. GALLAND, PAINTER-DECORATOR. — FRENCH SCULPTURE AT THE WORLD'S FAIR.

THE sitting of the Senate on February 9th was a good thing for architects. They carried off the honors of the day. They were the only persons talked about, and finally they secured the victory — an unexpected victory, and which, for us, has quite the air of a *coup de théâtre*, as to the cause of which we are still in ignorance. Evidently there were influences at work, some definite order had been issued, for this matter of reconstruction of the Opéra Comique seemed to have been resolved upon, finished, and yet, all at once, the Senate, disapproving the report of the Chamber of Deputies and the report of its own Commission, voted to put the matter to competition by a vote of 146 to 77. This vote surprised everybody. We architects had already put on mourning over this question, and the reception given our delegates by the Senate Committee had left us no hope. The intention of adopting the scheme of Messrs. Guillotin & Co. was so precise, the reports presented on this head so favorable, that I felt justified in speaking to you in one of my late letters of the report of M. Bunel, concerning the general arrangement of the new theatre. What was it that had transpired? There was certainly some underground work — fears of new scandals, probably fear of revelations dangerous for certain personages, who, doubtless, thought that the infamy of the great Panama scandal was quite enough, and that there was no need of allowing a "little Panama" to be discovered. It is under this title that one of our journals referred to the matter of the Opéra Comique. Whatever it was, the architects can only congratulate one another on the Senate's vote, which yields to them a fragment of hope, of confidence. The sitting of the 9th of February was so interesting, the political question was so hidden behind the artistic, that the readers of the *American Architect* will understand why I speak of it here. It was really quite a little lecture on architecture which was offered to the Senators — a lecture filled with just and often witty ideas. In the first place, M. Bardoux, the reporter of the scheme submitted to the Commission, explained and defended it, while acknowledging this project of reconstruction *à forfait* prepared by the Government was an exception which could not in application be extended. He recalled the different combinations proposed, the votes favorable to the project, the approbatory reports of the Conseil des Batiments Civils, of the Commission Supérieure des Théâtres, and other documents, in face of which the Senate Committee considered itself, just as the Government had, absolutely converted to the point of view of responsibility. M. Bardoux next spoke of the protests offered by the *architectes diplômés* and the Society of Provincial Architects, which could be thus epitomized: The State abandons the principles which are the safeguard of the construction of public buildings, namely, the competition, upon the one hand, and the adjudication, upon the other. The State had in the construction of the Opéra Comique the opportunity of offering a competition to all architects. The architects even went so far as to pretend, with some right, that the convention arranged with M. Guillotin & Co. was the very negation of French architecture. M. Bardoux declared that the Senate Committee had not felt it ought to accept these protestations, while quite approving the principles on which the architects supported themselves. But M. Bardoux held that, equally as a matter of principle, the State was always free to conclude arrangements like the one which it had proposed. He demanded whether the State, measuring the needs of the moment, could not provoke (this word is a veritable confession) a combination which permitted it to achieve a useful and practical result, long desired and earnestly waited for. Finally, he pretended, as he closed his speech, that there could not be another opportunity of making over the Opéra Comique, and that to accept either a competition or an adjudication was to dissipate every hope of attaining the end. M. Wallon answered him, and his speech, very clear and precise, resumes the question in simple form. Allow me to quote from it a few interesting passages. Speaking of the petitions of the architects, M. Wallon declared that one general idea sprang from it, that was that the destiny of architecture can be compromised by the process proposed by this enactment. Up to the present time, preëminence belonging to art, execution was subordinate to it. Now, the rules are to be reversed. An agreement is made with contractors, and they are the ones who furnish the architects. It is an "exception," but this exception may have very grave consequences. "You will see," adds M. Wallon, "syndicates of contractors undertaking the execution of works of art absolutely as they do masonry work. You will even see firms which will dispense with the aid of syndicates. The grand

establishments of the Louvre and the Bon Marché now furnish furniture, hereafter they will furnish buildings. They will have their shelves of buildings; they will furnish houses at command, just as clothes are made to measure; they will have their architects, as they have their cutters and fitters."

The principles of competition had been adopted by the Chamber and rejected by the Senate, which did not accept the vote of a credit of 30,000 francs required for this purpose; but the reasons for this step did not appear conclusive to M. Wallon. These reasons, poor enough ones in sooth, were that the competition, very logical when it is a question of carrying out a new idea and one demanding a serious effort of imagination, seemed quite useless considering the simple construction of a theatre, similar to numerous other theatres recently built and which ought to be executed with simplicity and absence of display. But, as M. Wallon justly remarked, the architect does not only occupy himself with making a fair façade and a fine staircase. There are arrangements to take both for the well-being and the security of the spectators, and from this point of view a great number of schemes offered by architects can give many a new and useful idea, without yielding anything to luxury and without the result costing any more. Is the scheme proposed really perfect? It has passed the Conseil des Batiments Civils and the Commission Supérieure des Théâtres; but it was, as it appears, allowed without much enthusiasm. M. Wallon understood, then, that in the interest of art the architects had demanded a competition, but to make an end of it, he proposed not to do nothing, but to build nothing, and to leave the Opéra as it is on the Place of the Châtelet.

M. Charles Dupuy, Minister of Public Instruction, answered M. Wallon and defended the Guillotin scheme. Taking up the history of the question, and finding, in passing, that architects are very exacting, he affirmed that the scheme included the most acceptable, and certainly the most realizable, conditions. "This scheme," added he, "the Conseil des Batiments Civils did not adopt at the first suggestion. It sent back the project for reconsideration as many as seven times, and it was only after an eighth and last reference that it was approved. The Commission des Théâtres then recognized that the criticisms, recommendations and requirements which it had declared, and the new conditions of security, were found to be satisfied by this project so far as it was possible to satisfy them." [Doesn't this, "so far as possible," suggest a feeling of uneasiness?]

In any event, it is to be remarked that the defenders of the scheme always contented themselves with vague terms. The objectors, on the other hand, were quite explicit, and M. Dulac, after M. Wallon, found the arguments brought forward against the competition of little weight. He also defended the cause of the architects with logic and good sense. "A well-organized competition," said he, "which strictly limits the expense and the conditions of the enterprise, would certainly give a scheme at least as good as that which was submitted, since its author could compete if he wished"— and this statement was entirely logical. "How does it happen," asked M. Dulac, "that a building does not offer matter for competition because it is to be simple, forsooth? Here is a grave artistic heresy! To execute richly and sumptuously is not always the way to produce a work of art. The artistic value of a monument is not very happily subordinated either to the expense or the richness or the number or the importance of its façades; and it is easier to build richly than to build well and fairly. The most modest construction, the least rich in luxury of materials, in sumptuous ornament, is a work of art through its own excellence, if it exactly answer the requirements which the programme imposed on it, and if he who has conceived it is inspired with the sacred fire; and it is especially for a building of this kind — a theatre — that free competition is suited. The home of art ought to be a work of art which does honor to the capital of the arts; it ought not to be a vulgar, commonplace building." This is well put. Bravo, Senator! Architecture salutes you, and thanks you for your valiant words.

In spite of this, the Minister of Public Works found himself induced to pretend that there was at the bottom of all this discussion only an architects' quarrel, and that these protestations emanated from the younger men who wished to compete and exhibit themselves to the public. But the question was already settled, and M. Monis gave it the *coup de grace*. While admitting that the scheme proposed might be the best that can be conceived of, he demanded that in any case it should be submitted to adjudication. Without it there could be no longer matters of art. There could only be matters of finance, which bring forward a charge upon the budget, of which there is no need, causing the payment of interest, which could be dispensed with, and bringing about a useless delay. "As to the project itself," declared M. Monis, "everybody has bragged about it to us, but no one has shown it to us. It has not been put to the test by being exhibited even in a shop-window. You do not show it because it is not acceptable." M. Monis, who has taken the trouble to hunt it out and has seen it, declares that it is abominable.

Be it understood that I merely give the sense of the speaker's words, and do not in any manner take part for or against this manner of looking at things. But it is certain that this famous scheme has been kept out of sight, and that very few persons have any knowledge of it. It is also certain that the Commission charged with advocating it before the Senate did not succeed in convincing that assembly, since, as I have said, it has been rejected and the competition has been voted. Now what will happen? How will all this end, and when will the Opéra Comique be remodelled? It must be hoped that the competitors will be given a reasonable delay. This is a question which greatly interests us in France (I speak of architects, of course), and it is for this reason that I have spoken, perhaps at too great a length, of this sitting of the Senate, where our interests were so vivaciously discussed. But the question touches national art, as well as the history of the future of the Opéra Comique.

As to the plan which formed the basis of this discussion this can be said: This contractor, M. Guillotin, studied the matter from the economic point of view, and brought about the acceptance of his plan. The economy of his scheme consists in paying the three millions and a half, the cost of the reconstruction, by annuities of 145,000 francs. This sum is found to be constituted almost exactly by the price of the present site of the hall on the Place du Châtelet, and by the interest on the indemnities paid by the insurance companies at the time of the conflagration.

M. Guillotin's plan of the new Opéra Comique includes the hall on the old site, increased by an extension of three metres on the Place Boieldieu, so that the total area is about 1,598 square metres. From the foundation up there is absolute separation between the stage and the auditorium. The cellars are separated from the floor above by floors of iron vaulted in brick. Under the parterre and the orchestra-chairs is the hot-air chamber. The first floor is at the level of the street, and consists of a large vestibule seventeen by eleven metres and eight metres in height, facing upon the Place Boieldieu. On the right and left two noble staircases lead to the upper portions of the building. The cloak-rooms and the ticket-offices are under the first run of the two staircases. Entrance is had to this vestibule through three large doors, and two other doors are arranged opening upon each of the side streets, and are calculated in such a way that the exits from the theatre provide a width of 1.60 metres per hundred spectators. Now, the ordinance of 1881 only demands sixty centimetres, while the regulations governing foreign theatres vary between fifty and seventy centimetres for the same number of spectators.

Upon the first floor, on the Rue Marivaux, are the barrack-rooms for the Garde Republicaine, for the police-officers and the Commissioner of Police, the bureau of the Management and cashier's office, with waiting-hall, architect's office, and so on. On the Rue Favart, on the other side, are the foyer of the musicians, the offices of the leader of the orchestra, concierge's room, the actors' entrance, the stage-door, and the electric counters. The stage-section contains a machine-pit hermetically closed; and add to this that from the great vestibule in addition to the lateral staircases, which lead to the upper stories, there are three others which serve the pit and the orchestra. On the entresol floor are the doctor's office, the foyer of the chorus, secretary's rooms and rooms for the machinists and supplies, which last extend through two stories. The entresol floor is almost on the level of the *baignoires* of the orchestra and the pit. At this level the circumference of the auditorium is diminished by a passage-way two and one-half metres wide, served by six staircases, three of which, as I have said, start from the vestibule and the other three directly from the side streets.

The orchestra contains 220 places. The old auditorium contains 234. The chairs are fifty-six centimetres wide, and between back and back intervenes a space of eighty centimetres. This is the regulation distance, and requires automatic lifting seats. In the pit the width of the stalls is forty-five centimetres. Two iron doors give access from the orchestra and the *baignoires* to the stage, the level of which is the same as that of the corridor. On this same level are found the actors' foyer, the manager's room, the office of the director, the administration bureaus, the firemen's posts, and the store-room for decorations. At the level of the first boxes on the side of the hall is the grand foyer, which has the same dimensions as the vestibule below, above which it lies. Three great bays on the Place Boieldieu give access to the balconies, which surround the building, with this peculiarity, that they are lateral on the two streets. These balconies are provided with two staircases running down to the street, and offer escape from the two upper stories. These two outside staircases can be used by the spectators, as well as by the artists, in case of alarm. Three passages lead up to the chairs in the balcony, which are arranged in three rows. At the second story we find the same exterior arrangement as in the lower story, so far as regards the balcony which encircles the building. Internally, a corridor 2.75 metres wide serves the boxes.

Now we come to the amphitheatre, which enjoys its own foyer, and besides, on each side of this foyer are a chorus-room and a little theatre for rehearsals. These different compartments have balconies overlooking the Place Boieldieu. Above the stage-boxes is a compartment for the chorus and one for the organ.

On examining the accommodation, we find that the new plan provides 1,514 places, while the old Opéra Comique provided 1,508. The whole structure would be of iron, brick and stone, and the ceilings would also be of iron, pugged with brick. For lighting electricity alone is proposed, and the scenery required for each week's performance would be stored in closed store-rooms. The firemen would have at their disposal large stand-pipes, and there would be forty stations.

In his report M. Bunel remarks that the scheme is not only conformable to the prescriptions of the ordinance of 1881, but also conforms to the new conditions now held to be necessary by the

Commission des Théâtres. This at least is consoling from the point of view of mere security.

One more artist has lately disappeared, an artist conscientious in his work, who will leave a great void in the field of decorative art. P. V. Galland was a painter-decorator highly appreciated. He was Director of Art Works at the manufactories of the Gobelins and Professor of Decorative Art at the École des Beaux-Arts. Death has carried him off at the age of seventy years. M. Galland had been prepared at an early age for his multiple and important labors. His father, a Genevese goldsmith, had given him his earliest instruction, and at the age of seventeen he entered as a student the office of Henri Labrouste. In 1840 he entered the École des Beaux-Arts, and afterwards his whole career was consecrated to works of ornamentation and decoration. Intrusted with numberless orders, he decorated many private buildings, dwellings and palaces in Paris, Marseilles, Madrid, London, St. Petersburg, Constantinople, New York, and so on. Among the chief Parisian buildings which contain paintings by M. Galland may be mentioned the Church of St. Eustache (angel figures), Panthéon ("Dedication of St. Denis") and Hôtel de Ville. It is in this building that a few months ago we admired his latest work. Here he had to decorate the ceiling of the gallery parallel to the grand reception-hall. This ceiling, composed of vaulted sections, gave him the idea of representing in each one of the guilds or trades which figured in the sixteenth century. These medallions are linked together by a decorative composition of a truly beautiful style and most skilfully studied, which all the more emphasized the lack of composition in the so-called decorative paintings which surround it. A very exact notion of the researches conducted by and the kind of decoration indulged in by M. Galland can be had at the Musée des Arts Decoratifs, which possesses many of his cartoons. Besides these, he also executed the models for a series of tapestries made by the Gobelins for the Palais de l'Elysée. And besides these, he was successful in the competition for the design of the diploma awarded at the Exhibition of 1889.

Now I will say a word concerning our exhibition at Chicago. The president of the Art Institute of Chicago has asked the Direction des Beaux-Arts to aid it in procuring full-size casts of the principal *chefs-d'œuvre* of French sculpture. In consequence of this, the American Society has acquired the following casts:

Frémiet's "Age of Stone," Chapu's "Jeanne d'Arc," Cain's "Rhinoceros attacked by Tigers," Rodin's "Burghers of Calais," Falguière's "Diana," Barrias's "Infant Mozart" and "Les dernières Funerailles," Mercié's "Quand Même," Paul Dubois's four figures from the monument of General Lamoricière, Idrac's "Salambo," Frémiet's "Jeanne d'Arc," Mercié's "Gloria Victis." These casts will adorn the French section at the time of the Chicago Exhibition. This gathering, to which will be added a new work by Falguière, "The Republic," will form an exhibition of sculpture of the greatest interest.

THE NEW GALLERY, LONDON.

"The Garden of Pan," after a drawing by Burne-Jones.

THE exhibition of the works of Mr. E. Burne-Jones is interesting from several points-of-view. It is always edifying to see pictures surrounded by those only which are sympathetic, and it is also instructive to be able to judge of an artist's power to escape monotony. Seen at the Academy, Mr. Burne-Jones's work may either look refined and cultured with vulgar surroundings swearing hard at it, or it may seem colorless, *fade*, doleful and unhealthy in the midst of a world of cheerful breakfastings, of happy picnickings, of laughing babes, and divers sorts of junketings and merry-makings. It all depends upon the point-of-view from which you eye Mr. Burne-Jones. He has an enormous number of admirers; you see them at the New Gallery, where any color except the negative greens, grays, reds, blues and yellows are conspicuous by their absence. Strange slouchy hats and flattened bonnets also prevail, and outside belts with huge silver clasps. All this is as it should be, and harmonizes with the pictures on the walls. But why, if modern art must be kept to close assimilation with that of the great Venetians and the early Florentines, should we trouble ourselves to read any new literature? Do the devotees of Mr. Burne-Jones confine themselves to Spenser, or Ben Jonson, or Shakespeare, or even Milton, Dryden and Pope? Are these authors among those in circulation at our libraries, public or private? Do we read Sir Philip Sydney? Do we sing the old madrigals and glees, or dance *gavottes* and *pavanes*? Why not? If our art is to be exclusively neo-Italian, why should we allow Nature to dominate our taste in the sister-arts of music and poetry? But, according to Mr. Burne-Jones's admirers, Nature is to be kept down: Art is above Nature; and yet one sees few votaries of the Greeks at the British Museum, and the exquisite Italian marbles at South Kensington are all but ignored by the fashionable world.

Mr. Burne-Jones's is such sad art — not in the sense of the sadness of Israel's work. There we see the pathetic side of nature, the melancholy of the world we live in, which tosses us about as a ship upon a rough sea — the inevitable partings of friends, the misery of poverty, the sadness of suffering. That is all human — and natural. But "Art should purify Nature"; it should give us a summing-up, as it were, of Nature at her best. Pure, unadulterated Nature is, to the cultured æsthete, unworthy of the painter's art. The commonplace incidents of daily life glorified by the feeling which a true artist can throw into them is not worthy the study of the painter. But allowing that we must set aside the commonplace, *i. e*, the human element, why need we see such subjects as the "Annunciation," the "Chant d'Amour," the "Wine of Circe," "King Cophetua and the Beggar-maid" and "Hope" through the medium of such melancholy glasses?

And then, again, the distressful expression upon all the faces, from the angels and the Blessed Virgin down to the Beggar-maid and little mischievous Love. Even the small children surrounding Charity seem oppressed by the usual dyspepsia. They are charming, all the same, although one cannot help comparing them to the lovely little rose-colored cupids of Rubens, rollicking, chubby, delighting in life and bursting with health. Perhaps, taking into consideration all Mr. Burne-Jones's attributes and failings, the "Merciful Knight" is one of the most satisfactory of his pictures. It, too, is in a minor key; but when a man has had an enemy and been well-nigh a murderer, when he has foregone a soldier's privilege of slaying an adversary, he may be depicted in all the pathetic beauty of the romantic minor. Again, is not the coloring of Mr. Burne-Jones terribly monotonous? The living mermaid and the dead man, the angels and the knights, Fortune and her victims, the portraits of children and the Classic goddesses, are all of one tone — often a very rich and fine tone, and perhaps "glorified nature," but never the exquisite beauty of Nature's own coloring, whether we think of her in human form or in the silent loveliness of skies and trees and brooks.

But, in spite of these peculiarities of Mr. Burne-Jones's art, in spite of monotony of expression and color, of utter inability to see, except from a preconceived point-of-view, in spite of his want of the power of appreciation of all Nature as she exists and of all Humanity as it feels, there is a charm about his work which no one can help acknowledging, although we may not care to be charmed very often. It is like the music of Bach, very fine, but very monotonous, wanting in color and variety, lacking the emotional element and completely passionless. To live with such art would be, to some of us, like sitting under a wet blanket: it would seem frivolous to laugh or to make merry. A sigh at intervals, speech with bated breath, and a sad countenance seem to be the fit accompaniments of such works as "Fortune's Wheel" and "King Cophetua." Even the Blessed Virgin looks distressed at St. Gabriel's salutation, and the angels of the "Creation" seem to lament the work which God saw to be "good." What is Mr. Burne-Jones's own is his exquisite drawing and modelling; his drawings in chalk, in pencil or in any form of monochrome are simply perfection. S. BEALE.

BOOKS — PAPERS.

IT is with mingled feelings that we lay down Mrs. Van Renssalaer's book[1] on the English Cathedrals, and we regret to find that any portion of them shade into sensations of discontent and disappointment. It is almost needless to say that the author has done her work with admirable thoroughness and her accustomed literary skill, but in spite of this it smacks of the magazine and so, almost, — may we be pardoned for saying it — of the literary hack. It seems to lack the element of spontaneity which one looks for in the most ambitious work of an accomplished writer, for it is but fair to assume that when a

[1] "*English Cathedrals*," Canterbury, Peterborough, Durham, Salisbury, Lichfield, Lincoln, Ely, Wells, Winchester, Gloucester, York, London. By Mrs. Schuyler Van Renssalaer, author of "*Henry Hobson Richardson and his Works*," "*Six Portraits*," etc. Illustrated with one hundred and forty-five drawings by Joseph Pennell, also with plans and diagrams. New York: The Century Co., 1892.

person undertakes a task of such magnitude and of so monumental a character he or she enters upon the work because of being impelled by overwhelming predilections in favor of the chosen topic; but in this case one cannot resist the feeling that while for the writer the intellectual enjoyment remained the sentimental attraction was wanting. In part this inference is due to the peculiarities — or rather individualities — of the writer who, like many another, has more than one style of composition. One cannot but enjoy the precision and propriety of the language used, but when she writes upon matters architectural, we have been often impressed with the seeming fact that words are used which while they convey a definite meaning to the intellect make no appeal to the sensations. In this they differ from the language used in speaking of the work of painters, where one feels the quickening of the senses at the same time that the intellect approves the method of statement and deduction; here the words have warmth and suggest motion. In this book one seeks to find how language can better express the writer's meaning, but every word is fitted to its place with careful precision, — too careful at times, when it comes to the description of the landscape setting of a cathedral, where one would prefer to have the matter sketchily presented, so that the reader's imagination might be allowed to arrive at its own conclusions; doubtless these conclusions would be largely false, but just as few would care to have absolute knowledge of to-morrow's happenings, so we feel that few like to have stated for them the exact form of thought and sentiment best suited to a given condition or situation.

But the chief obstacle to complete enjoyment of the book lies in its composite character and the conditions under which it was prepared for the reader. Readers of the *Century Magazine*, for which these Cathedral papers were prepared, are people of general cultivation, and so, of course, might be assumed to have, like people of their class, an interest in the English cathedrals, but a general interest, not a specific one, and this skin-deepness had to be recognized in the preparation. The result had to be so far "popular" in treatment as to meet the appetite of the magazine-reader and yet the dignity of the subject, and the reputation of the writer made it compulsory that the element of real technical statement and defensible comparative criticism should not be neglected. To satisfy both of these conditions and to err neither upon one side nor the other was a difficult undertaking, one almost impossible of entirely satisfactory treatment from both points of view — as the result shows.

We fancy that the purpose of the magazine's editor was to provide a vehicle for the introduction of numerous interesting illustrations and to furnish intending travellers with an introduction to an important class of "sights," rather than to bring about the preparation of an elaborately illustrated architectural treatise, and that, consequently, the ideas of projector and executor were somewhat at variance.

There are several points of view from which the English cathedrals could be considered. First, being given the necessity of being "popular," there is the pictorial, where the actual illustrations are the kernel of the enterprise and the text but aids in interpreting and translating the imperfect work of the draughtsman, and secondly, there is the historical, where the writer considers the church fabric and its surroundings mainly as the settings for a recounting of historical facts, with which may be interwoven anecdote, legend and poem, with the result that a living and vital presentation may be created which will make a vivid impression on the reader and be of untold value to the ordinary cultivated traveller when he visits the places where these historic events transpired. Either of these two methods, the historical or the pictorial, alone or in combination, seems entirely suited to magazine use.

Besides these there is, in the third place, the archæological and, lastly, the strictly architectural standpoint, neither of which seems to be a good starting-point for magazine literature, which has to be taken in small doses at intervals of time and between the digestion of fragments of wholly dissimilar pabulum.

To attempt to combine all four of these methods in a single treatment, particularly one so circumscribed by having perforce to be cut up like a pie to fit the appetites of magazine-readers, was an ambitious undertaking, and one which had rather remote chances of being satisfactory and successful. So far as success was possible, we feel that Mrs. Van Renssalaer has attained it in high degree, and where she has failed, it has been due to undertaking to give a complete treatment in an inadequate space, and has felt constrained to address herself now to the interests of such a class of readers and again to another. Left to her own devices, we judge, from internal evidence, she would have treated her subject in the historico-archæological manner, proceeding from cause to effect, taking as a starting-point the paper published some months ago in the *American Architect* on a forgotten chapter of English History, which offered one of the most inviting fields of inquiry that could have been devised and one which the logical character of Mrs. Van Renssalaer's mind peculiarly fitted her to follow. Having created a knowledge of the manners, customs and conditions of life of the cathedral-builders, the architectural story could have been told progressively and from within instead of being disentangled from without, in shreds and patches as it were.

So far as we entertain feelings of discontent, — or rather exasperation, — they are caused by the fact that the work is illustrated with such incompetence; for however admirable Mr. Pennell's work may be from the pictorial point of view, its value as part and parcel of an architectural description of a building is infinitessimal, and we say this with due knowledge that Mr. Pennell has expressed the belief that architects particularly admire his work; and so they do as *pictures*, but not, we believe, as aids to understanding an architectural composition — certainly not in so far as its constructive elements are concerned. In the case of this book, Mr. Pennell seems to have resolutely ignored the wishes and necessities of his fellow-worker, and where the context distinctly calls for an illustration which shall declare the justice and validity of the writer's statements and conclusions there will be found a pretty pictorial sketch of some totally different portion of the building. To represent the same building as a whole over and over again, from different points of view and under differing conditions of light and shade, is not to do what one has a right to expect an architectural illustrator should do. As pictures the illustrations are always pretty, generally delicate and often brilliant, but so far as real architectural information goes the cuts used in illustrating one cathedral might almost as well have been used for its neighbor on the other side of the island.

To tell the story of English cathedrals twelve have been selected, each considered after a similar but not identical method: Canterbury as the Mother Church of England; Peterborough as, on the whole better than Durham, illustrating the Anglo-Norman work; Durham because of the merits and peculiarities of the site on which it stands, in addition to its architectural interest and its complete presentation of the monastic building of the "old foundation"; Salisbury as the perfect type of Early English work; Lichfield as exponent at once of the Decorated style and of the cathedral town where all is absorbed in the cathedral, and as a building which played an important part in England's civil wars; Winchester as type of Perpendicular work. These serving to typify the several phases of English archiecture, there is added to them Ely, because of the significance of its lovely site in the fens and because to leave out Ely's octagon and lantern would be as if leaving out Hamlet himself in the play; while Wells and York and Lincoln are added because each embodies some element of composition or growth which expresses a fact less clearly shown elsewhere. The last building considered, a building which forms a class by itself, which teaches lessons taught by no other, is St. Paul's.

In some ways this is the most satisfying chapter in the book. In the first place, in a very small space, Old St. Paul's is brought before the reader as an interesting structure belonging to quite modern times and not altogether the mythical building, of appearance and composition which elude the descriptive powers of the architectural writer, and next St. Paul's itself is treated rather comparatively as regards the design and its inception than descriptively as regards accomplished facts. Even the architect who has been able to travel finds this handling more entertaining and instructive than the strictly descriptive method. It is more stimulating, the data for the formulation of the hypotheses are stated and the inductions drawn from them, but you are furnished with the means of drawing other inferences from them — if you can. That is, you are placed practically on even footing with the writer, who no longer talks *ex cathedra*, but takes you into his confidence and in a familiar way shows you what he thinks and why. It is an altogether pleasanter manner than the merely magisterial.

On looking back again at the book one cannot but be impressed with the amount of time and labor that must have been spent in accomplishing this work. It is not a supposable probability that it was accomplished by taking one cathedral after another in the order named and exhausting it at one visit. There must have been necessity for constant revisitation of one or another building to verify an impression, or to test a new inference suggested by investigation in another part of the island. Fortunately the island is not large and these marches and countermarches which have ended in adding vitality to the work, and differentiating it from one that might have been compiled by aid of books and photographs, can but have added interest to the task without increasing its wearisomeness.

Some English critics have taken Mrs. Van Renssalaer to task because she so frankly avows her belief that, in comparison with French Gothic work, the result of English design and workmanship can hardly be held to stand on the same plane. We can understand the feeling of the Englishmen, though we cannot share their belief that the French Mediævalist was not immeasurably the superior of his English contemporary. It seems to us that the French work and English work can rarely be compared, that are rather to be contrasted. The one always appears a piece of architectural construction and would remain so no matter where it might be placed or amid what surroundings. The other is, of course, also an architectural construction, but it is never so held primarily for it is always considered in intimate connection with its site. The great charm of English cathedrals is due quite as much to the propriety of their landscaping as to their strictly architectural properties. Interchange a French and English cathedral and the result would be, we fancy, that the French building in its new setting would, though looking strange and out of place, lose nothing in architectural dignity, might even gain some added grace, while the English building would remain a veritable alien which could never be aught else, one whose architectural and structural inconsistencies would but be more insistently apparent as time passed. Put into other words, we have a strong feeling, not only regarding the cathedrals but as touching all other English buildings, that the first merit of English architecture lies in the surpassing beauty of the English landscape and the great skill with which buildings are adapted to it.

So few treatises on the subject of transvere strains are of real practical value in the sense of being clear and concise and without the encumbrance of abstruse mathematics, that William H. Birkmire's work on Riveted Girders [1] ought to be a welcome addition to the library of the busy architect who prefers facts to formulas. We confess to having had a feeling, engendered doubtless by too rash experiments with the differential calculus, that there was something necessarily complicated about the strains in a girder, and it is a relief to find that the simple, easily-understood rule-of-thumb methods which have sufficed us for office practice are founded on scientific deductions and are approved by an engineer who has made iron-construction a special study. The book is admirably written for its purpose, treating the topic in the most thorough manner in all its details, without assuming that the reader is either a total ignoramus or a profound mathematician, and it requires for its complete understanding no mental operation more involved than multiplication or division. The author makes a very apt distinction between "the outer forces which act at various portions of the girder, tending to cause motion of its parts, and the inner forces which prevent this motion. The first we may call stresses and the second strains. We therefore speak of the stresses *upon* a girder and the strains *in* a girder." Both analytical and graphical methods are explained, and the whole subject is resolved so simply that in the space of a hundred pages there is opportunity for adding numerous practical examples which fully apply every rule and formula. A very convenient rule is given for calculating the approximate weight of a girder before its dimensions are fixed: $w = \frac{WL}{C}$ in which w is the weight sought for, W the load to be supported, and C a constant taken from examples of girders from thirty-five to fifty feet long, its value being 700. Another factor of a riveted girder which is carefully analyzed is the capacity of the web to resist buckling, — a very important consideration, and one which the beginner is quite apt to neglect. This condition is attained when the shear per square inch of cross-section at any point does not exceed the safe resistance to buckling per square inch,

$$= \frac{10{,}000}{1 + \frac{d^2}{3{,}000\, t^2}}$$

when d = depth and t = thickness of web in inches. The origin of this formula is unfortunately left by the author in obscurity, and in the examples given as illustrations the webs when too weak for buckling, as first calculated for shear, are reinforced by angle stiffeners, whereas the same result could probably be attained in less time at probably less expense by simply thickening the web throughout. However, all formulas, even the very excellent ones presented in this volume, can be used intelligently only when applied with a liberal admixture of the common-sense which is supposed to result from practical experience and which is, after all, the real basis of all true theory. Nor can exact constants be given which will fit all cases, as when the author states that bed-plates of girders must be of such dimensions that the greatest pressure on the masonry shall not exceed 250 pounds per square inch or eighteen tons per square foot. This would be a very slight allowance for block granite, but is far too high for brickwork, which, by the Boston law, can be loaded with not more than fifteen tons per square foot, or even less, if laid-up with any but the best of materials. But that is a question of masonry rather than of riveted girders, and the latter subject is so completely elucidated by the book in question as to leave little ground for objections.

BESIDES being of special interest to Mr. George P. Merrill, who recently declared his belief that his book on building-stones was not appreciated by architects, the following examination-paper used by Professor Chandler at the Massachusetts Institute of Technology may have interest to our readers. It may be added that the answers to these questions are expected to be based on Mr. Merrill's own book, which is considered at the Institute an "important reference-book."

EXAMINATION IN BUILDING-STONES — COURSE IV.

1. (*a*) What is the chief defect of serpentine, considered as a building-stone?
   (*b*) Describe the onyx or travertine marbles, and state how they are formed.
2. (*a*) The hardness of a rock depends upon two factors. Explain.
   (*b*) Compare the coarse-grained and fine-grained rocks with respect to durability, strength, homogeneity and general adaptation to use as building-stones.
3. (*a*) How do alternations of heat and cold affect the disintegration of rocks?
   (*b*) Why is this action more marked with rocks of mixed than of simple composition?
4. (*a*) How do variations of temperature cause the opening of joints in masonry?
   (*b*) Which has the highest coefficient of expansion — granite, sandstone or marble?
   (*c*) What is the relative behavior of these three stones on exposure to fire?
5. (*a*) What do we mean by the quarry water?
   (*b*) Explain the seasoning of stones.
   (*c*) Ought stones to be dressed before or after seasoning? Why?
   (*d*) Is this principle of greater importance with the crystalline or with the fragmental rocks?
6. (*a*) Is the high state of preservation of many of the stones used by the ancients evidence of the exercise of care and intelligence in selection? Explain.
   (*b*) Explain how observations on the natural ledges and in quarries may aid in the selection of building-stones.
   (*c*) Will stones, as a rule, decay more or less rapidly in a building than in the ledge? Why?
7. (*a*) What is the relation of porosity in stones to possible injury by freezing?
   (*b*) What constituents of building-stones are most subject to oxidation?
   (*c*) Under what circumstances is oxidation beneficial to stones?
8. (*a*) Some stones are found to be bluish or gray below the permanent water-level of the country, and buff or brown above it. Explain.
   (*b*) Which would you select for use in a structure where unchanging colors were specially desired?
9. (*a*) Are the upper or under surfaces of stones projecting from a wall most liable to injury by frost? Why?
   (*b*) What stones cannot be safely quarried in winter? Why?
10. (*a*) In what ratio does the resistance, per unit of surface, to crushing increase with the size of the blocks?
    (*b*) What circumstances make crushing tests of little value?
    (*c*) Why is slate so little used as a general building-stone?

January 14, 1893.

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[1] "*Compound Riveted Girders*," as applied in the construction of buildings. By William H. Birkmire. New York: John Wiley & Sons.

SOCIETIES

AMERICAN INSTITUTE OF ARCHITECTS.

FOR the information of members of the American Institute of Architects and of architects throughout the country, I have caused the act authorizing the Secretary of the Treasury to obtain plans and specifications for public buildings, which was approved February 20, 1893, to be printed, and I send a copy of the same to you with this circular, hoping that you will use your influence to assist in bringing about an application of the law in connection with the designing of the first building of importance which may be erected under the direction of Hon. John G. Carlisle, the new Secretary of the Treasury.

The officers of the American Institute of Architects will take an early opportunity to promote the objects of the bill, and would be glad to receive from any member any information which he may have of the probability of the erection of any Government building, plans for which have not already been made.

It is hoped to have the first competition put upon such a basis that it will serve as a precedent for future competitions, and that it will embrace the following conditions, to wit: a full and comprehensive statement of the requirements of the building and an accurate topographical map of its location; a definite statement of the number of drawings required and the manner in which they shall be rendered, making the number of drawings as small as possible and the rendering as simple as may be; a definite time for the competition to close by setting a day and hour, beyond which no drawings can be delivered at the office of the express company transporting said drawings, if they are to be considered, and requiring that a duplicate receipt from the express company shall be sent to the Secretary of the Treasury, or his representative, stating the hour at which the drawings were received for transportation; that a jury of award of not less than three architects shall be selected and named in the terms of the competition, one of whom shall be the Supervising Architect, and the others shall be selected from practising or retired architects, who do not propose to compete in any way, or to be interested in a business way, with any of the competitors.

It is believed that if the general provisions herein enumerated be fully and plainly set forth and faithfully carried out that most of the best architects of the country will gladly participate in some one of the competitions which it is hoped will result from the power placed in the hands of the Secretary of the Treasury by this bill.

A debt of gratitude is due to the past Supervising Architects, Messrs. William A. Potter, James G. Hill and James H. Windrim, Fellows of the American Institute of Architects, for the active missionary work which they have done and which has made it possible to obtain this enactment, and to the present incumbent of the office, Mr. W. J. Edbrooke, Fellow of the American Institute of Architects, for the favorable attitude which he took in advising President Harrison to sign the bill.

ALFRED STONE,
Secretary.

BILL TO SECURE DESIGNS FOR UNITED STATES GOVERNMENT BUILDINGS.

[Public — No. 77.]

An act authorizing the Secretary of the Treasury to obtain plans and specifications for public buildings to be erected under the supervision of the Treasury Department, and providing for local supervision of the construction of the same.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the

Treasury be, and he is hereby, authorized in his discretion to obtain plans, drawings and specifications for the erection of public buildings for the United States, authorized by Congress to be erected under the supervision and direction of the Secretary of the Treasury and the local supervision of the construction thereof by competition among architects under such conditions as he may prescribe, and to make payment for the services of the architect whose plan may be selected out of the appropriations for the respective buildings: *Provided*, That not less than five architects shall be invited by the said Secretary to compete for the furnishing of such plans and specifications and the supervision of such construction: *And provided further*, That the general supervision of the work shall continue in the office of the Supervising Architect of the Treasury Department, the Supervising Architect to be the representative of the Government in all matters connected with the erection and completion of such buildings, the receipt of proposals, the award of contracts therefor and the disbursement of moneys thereunder, and perform all the duties that now pertain to his office, except the preparation of drawings and specifications for such buildings and the local supervision of the construction thereof, the said drawings and specifications, however, to be subject at all times to modification and change relating to plan or arrangement of building and selection of material therefor as may be directed by the Secretary of the Treasury.

Approved, February 20, 1893.

ART STUDENTS' CLUB, WORCESTER, MASS.

Mr. Edward Topanelian, who has charge of the catalogues for the annual Spring Exhibition of the Art Students' Club, has sent out schedules for the same, to be returned to him April 8th. The exhibition opens Monday evening, April 24, by a reception to members and friends, and to the public Tuesday morning, and continues the remainder of the month. A large number of oils, water-colors and black-and-whites are expected, including some from Boston, Providence and elsewhere.

ILLUSTRATIONS

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

ALL ANGELS' CHURCH, WEST END AVENUE AND 81ST STREET, NEW YORK, N. Y.

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

We have been given to understand that "the Rev. Charles F. Hoffman designed All Angels' Church in all of its details." The drawings, however, were made by and the building erected under the supervision of Messrs. J. B. Snook & Son, Architects.

TOWER AT VIRE, FRANCE.

CHURCH AT PATERSON, N. J. MR. CHARLES EDWARDS, ARCHITECT, PATERSON, N. J.

FERRY HEAD-HOUSE, EAST BOSTON, MASS. MR. E. M. WHEELWRIGHT, CITY ARCHITECT, BOSTON, MASS.

"SHADOW BROOK," LENOX, MASS. MR. H. NEILL WILSON, ARCHITECT, PITTSFIELD, MASS.

The building will be made of native blue limestone, cypress timbers and cement, the roof of tiles, copper decks, flashings, etc. The work is well under way and the building will be inlosed by November, 1893. Front of building, 298 feet, average depth, 97 feet.

[Additional Illustrations in the International Edition.]

MATERNITY HOSPITAL, PARIS, FRANCE. M. BAPAUME, ARCHITECT.

[Photogravure.]

PLAN OF THE SAME.

[Engraving.]

DETAIL FROM THE TEMPLE OF VISHNU AT TADPUTRI, INDIA.

[Copper-plate Etching.]

This etching, after a drawing by M. Tissandier, shows a portion of this temple, which remains in a remarkable state of preservation. The bases of the columns are granite, the ornaments are in terra-cotta, painted and gilded.

HALTON, HERTS.

ASCOT WOOD HOUSE. MR. A. CAWSTON, ARCHITECT.

DESIGN FOR ENTRANCE TO A CHAPTER-HOUSE.

In the instructions for the Soane Medallion Competition, 1892, subject, "Design for a Chapter-house," the entrance was expressly mentioned for illustration and design, together with the cloisters. The sheet here given was entirely devoted to this subject.

An ambulatory was carried round the main fabric, connected with, and on the same level as, the cloisters, the chapter-house itself being raised about eight feet above these walks, thus necessitating the staircase illustrated.

The plan, which has been added for the purpose of this illustration, is drawn to show more clearly than in the original one the simple lines on which it is set out: Two squares placed diagonally over each other, the projecting angles forming a distinct bay in the ambulatory to every face of the octagonal chapter-house. The style throughout was late fifteenth century. The design is by Mr. Heber Rimmer, of Chester, to whom the Soane Medallion was awarded.

SACHSENHAUSEN, FRANKFORT.

[By an oversight Mr. Collcutt's name was given as that of the architect of the Premises in Mount Street, published last week, instead of Mr. A. J. Bolton's.]

COMMUNICATIONS

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

THE CAPITOL AT HARRISBURG: — A CORRECTION.

Harrisburg, Pa., March 24, 1893.

To the Editors of the American Architect: —

Dear Sirs, — Your favor of the 18th was duly received and should have been replied to at once, but unfortunately press of business prevented, and it was thus laid aside. The architect of the present State Capitol building of Pennsylvania was Stephen Hills, a native of Boston, not Mills, as you supposed. Your sketch I consider a very unfortunate one, as it does not give a proper view of the main building. From the one given it would be supposed that the edifice on the foreground was attached to the main building, when in fact it is a separate and detached structure, occupied by the Secretary of Internal Affairs, and has been added to within the last twenty-five years. Hills erected several other buildings in this city, which are just as substantial after the lapse of seventy years as when first erected. The State Capitol buildings have never had a flaw, not even a cracked brick. A peculiar style of Mr. Hills's designs is that everything was elliptical.

If I can be of further service write me.

Yours with respect,

William H. Egle, *State Librarian.*

FIGURED DIMENSIONS.

Erie, Pa., March 20, 1893.

To the Editors of the American Architect: —

Dear Sirs, — In general building practice, is it not customary to give preference to notes and figures on drawings over rule measurements, and when such notes or figures are shown, do not those who adopt rule measurements do so upon their own responsibility?

Yours truly, C. F. Dean.

[Although the custom you refer to is a common, almost a universal, one, it is usual to introduce in the general conditions prefixed to a specification a clause declaring that "figured dimensions shall always be preferred to scale measurements." — Eds. American Architect.]

MILL-CONSTRUCTION: WHAT IT IS, WHAT IT IS NOT.

Boston, Mass., March 21, 1893.

To the Editors of the American Architect: —

Dear Sirs, — Having reference to your editorial on what has been called "Mill-construction," I may rightly offer a few remarks, as I have had something to do with promoting its adoption outside our mill practice.

The system of mill-construction should be considered as a whole by any architect who undertakes to apply it, otherwise grave errors may be made. The very title, which I have given it myself, that of "*Slow burning Construction*," would sufficiently indicate to any thoughtful person that mill-construction did not consist simply or wholly in laying floors or roofs of thick planks on heavy timbers, spaced widely apart. That is but one element in slow-burning or mill construction. It goes without saying that wide and exposed surfaces of wood, however disposed, may burn rapidly under almost any conditions, *if not suitably protected*; and will surely burn rapidly if so finished as to promote the rapid spread of fire upon or under such wooden surfaces, without any provision for stopping such fires.

No advocate of mill-construction pretends that there are not examples of so-called fireproof construction which will burn more slowly, or which will be destroyed by fire more slowly, than any possible construction of wooden timber and plank. But the so-called fireproof factories of Europe have been completely destroyed in many instances by the rapid combustion of their contents, and I think you are in error in your conception that the contents of a textile factory, while perhaps less in quantity than the customary contents of most of the commercial warehouses, are not, on the whole, more destructive when ignited.

The motive of mill-construction is economy (standard of cost 75 cents per square foot of floor) as well as safety. There are many classes of business that will not bear the heavy cost of a more strictly fireproof method of construction. Moreover, the mill-construction of the factory has proved to be so safe as a whole, and such factories have been covered by mutual insurance at so little cost, as to render it wholly inexpedient or even unnecessary for the owners of textile factories and workshops to take any other method into consideration. For instance, wherever the mill-floor, suitably constructed of three-inch plank, grooved and splined, covered with one-inch top boarding, laid on timbers eight or ten feet on centres, has been made continuous — that is to say, without any break for belt-holes, open elevators or open stairways — it has never been burned through by a fire upon the floor or by fire passing through the floor above, except in one instance, and that was in a warehouse where a pile of jute bales took fire by spontaneous combustion in the bottom tier where it could not be reached. Fires on such mill-floors have not only been held in this building but in the room where they originated.

Again: iron posts have been crippled or sprung by heat a great many times at an early period in a fire. A wooden post of suitable size has never burned off until other parts of the building were already destroyed. They have in one instance [1] resisted fire for hours which destroyed granite posts close by them by reducing them to sand — the granite measuring 12″ x 12″.

In other words, let me repeat, the mill-floor properly constructed and rightly guarded has sufficed to hold fires not only in the building but in the room in which they have originated until the mill fire-department or the public fire-department could extinguish the fire. The wooden mill-post of suitable size will last longer than the floor.

The mill-floor possesses this advantage, which is a very great one, over the ordinary joisted floor: Fires may be readily swept away between the timbers either by sprinklers or by water from hose-pipes; while in the joisted floor the fire will burn on one side of the joist while the water is playing on the other side.

Lest this mode of construction should be subjected to prejudice through ignorance, I will now state what mill-construction is and what it is not.

WHAT MILL-CONSTRUCTION IS.

1. Mill-construction consists in so disposing the timber and plank in heavy solid masses as to expose the least number of corners or ignitable projections to fire, to the end also that when fire occurs it may be most readily reached by water from sprinklers or hose.

2. It consists in separating every floor from every other floor by incombustible stops,— by automatic hatchways, by encasing stairways either in brick or other incombustible partitions,— to the end that a fire shall be retarded in passing from floor to floor to the utmost that is consistent with the use of wood or any material in construction that is not absolutely fireproof.

3. It consists in guarding the ceilings over all specially hazardous stock or processes with plastering laid on wire-lath, or upon dovetailed-lath, following the lines of the ceiling and of the timbers without any interspaces between the plastering and the wood; or else in protecting ceilings over hazardous places with tin or other suitable metal.

4. It consists not only in so constructing the mill, workshop or warehouse that fire shall pass as slowly as possible from one part of the building to another, but also in providing all suitable safeguards against fire.

5. It consists in laying the top floor and an outer boarding of the roof *over mortar* laid upon thick plank, where the maximum of safety is to be attained.

WHAT MILL-CONSTRUCTION IS NOT.

1. Mill-construction does *not* consist in disposing a given quantity of materials so that the whole interior of a building becomes a series of wooden cells; being filled with concealed spaces, either directly connected each with the other or by cracks through which fire may freely pass where it cannot be reached by water.

2. It does *not* consist in an open-timber construction of floors and roof resembling mill-construction, but of light and insufficient size in timbers and thin planks, without fire-stops or fire-guards from floor to floor.

3. It does *not* consist in connecting floor with floor by combustible wooden stairways encased in wood.

4. It does *not* consist in putting in very numerous divisions or partitions of light wood.

5. It does *not* consist in sheathing brick walls with wood, especially when the wood is set off from the wall by furring, even if there are stops behind the furring.

6. It does *not* consist in permitting the use of varnish upon woodwork over which a fire will pass with the speed of a race-horse.

7. It does *not* consist in leaving windows exposed to adjacent buildings unguarded by fire-shutters.

8. It does *not* consist in permitting the storage of very combustible goods without protecting the ceilings with solid plastering or metal.

9. It does *not* consist in leaving even the best-constructed building in which dangerous occupations are followed without automatic-sprinklers and without a complete and adequate equipment of pumps, pipes and hydrants.

10. It does *not* consist in using any more wood in finishing the building after the floors and roof are laid than is absolutely necessary, there being now many safe methods available at low cost for finishing walls and constructing partitions with slow-burning or incombustible material.

There are other slow-burning methods of construction which are practised in Europe, and I will venture to make a suggestion from my customary Philistine standpoint.

In my own practice, I am called upon to deal only with the construction of factories and workshops. I have therefore never given that close attention to the construction of floors in the low-priced or low-cost buildings of Europe which might well be given to it. I have observed in passing by the way many methods of constructing floors in cheap dwelling-houses and in low-cost structures, both in England and in France, of which owners, architects and builders in this country appear to be totally ignorant.

There are many methods of combining coal-ashes and plaster in a substance known in England as "breeze," which is filled-in between wooden or light iron joists. I have asked many architects what "breeze" was, and I think I have never found but one who could answer the question.[2] There are also methods of incorporating thin hoop-iron set edgewise with incombustible material which are supposed to be effective in strength and safety.

My attention has been called to other ways, but time has not sufficed for me to deal with this branch of work. Many of these foreign methods are available here, although we have not the advantage of the soft stone so common on the Continent, which cuts almost like cheese and hardens like iron.

If it came within the scope of factory mutual insurance to investigate this matter I should long since have had a complete study of the subject, and my Philistine suggestion is this:

If the young architects who are sent out on travelling-scholarships, or who pass one or two years in Europe at the École des Beaux-Arts, would forego the fine-art study for a time, of which many types are for many reasons wholly out of place in this country, and would devote themselves to the prosaic study of how to construct a slow-burning floor in a dwelling-house at low cost, there might be considerable progress in that branch of architecture which has until recently been so much neglected, to wit, the art of building safely at low cost.

I have so far omitted one caution which I find it always necessary to give to those who are not trained in open-timber or mill construction.

It is dangerous to paint, varnish, fill or encase heavy timbers and thick plank as they are customarily delivered, lest what is called dry-rot should be caused for lack of ventilation or opportunity to season.

It follows that if plastering is to be put upon a ceiling following the line of the under-side of the floor and of the timber, it should be plain lime-mortar plastering, which is sufficiently porous to permit seasoning. The addition of the skim-coat of lime-putty is hazardous, especially if the top-floor is laid upon resin-sized or asphalt paper. This rule applies to almost all timber as now delivered, except to vulcanized timber, which, so far as we yet have evidence, is so fully seasoned by the baking of the albumen in the pores of the wood as to be safely subject to being painted or finished when first put up.

Yours very truly,

Edward Atkinson.

[Inasmuch as the text for this communication is indirectly drawn from the recent fire on Lincoln Street, Boston, we will take occasion to draw attention to one article the use of which helped to check the fire at the Brown & Durrell building in only a less degree than the fire department and the automatic-sprinklers. The walls and ceilings of this building were largely plastered with Adamant Wall Plaster, which has, by this fire, been proved to possess qualities of the greatest value. Not only did these ceilings check the spread of fire from below, but even prevented it from penetrating downwards in those places where the floor was burned through from

[1] "——Manufacturing Company. Soon after starting in the morning, it was found that the dust-room occupying the basement was thoroughly on fire. The fire was caused by the friction of the fan of a picker against some obstruction in its case.

"The fire was extinguished by the use of four one-and-one-eighth-inch hose-streams in the dust-room. It was prevented from destroying the building by flooding the floor from above with water from open butts. A strong wind was blowing toward the main mill at the time of the fire. The fire lasted two or three hours. During a portion of the time the flames rose forty feet above the top of the dust-chimney. The section is thirty by ten feet (?). The wooden posts and beams were reduced to about one inch in diameter, and about half to three-quarters of an inch was burned off the under side of the floor. Some of the basement supports were of granite one foot square. They were so weakened by crumbling and scaling off as to be in a very dangerous condition, one of them falling out completely and leaving the floor above unsupported at that point.

"The fire serves as a reminder of the necessity of protecting old work in dust-rooms with wire-lath and plaster. It also shows the great danger of relying upon granite as affording any sufficient resistance to fire. These granite posts had been put in when the building was built. The wooden posts had been added as a precaution."

[2] The accident at the "Shoreham," in Washington, two years ago, was caused by the attempt, improperly carried out, to be sure, to make a fireproof floor by the use of this same "breeze."— Eds.

above by reason of the fall of the burning roof-timbers. In several places the flooring boards, joists and wooden laths were practically burned away, and yet the ceiling of Adamant remained unbroken, and at the end of the fire was found not only intact but supporting the weight of several inches, depth of water over a considerable area. Used on wire-lathing it seems to offer one of the best fire-and-water-resisting wall and ceiling finishes now in the market, but its close molecular structure would require the use of special methods of application to minimize the danger from dry-rot. — Eds. American Architect.

MR. POULSON'S "COPPER HOUSE."

New York, N. Y., March 28, 1893.

To the Editors of the American Architect: —

Dear Sirs, — In your issue of March 25 we notice a paper on Fireproof Construction, read before the Society of Arts at the Institute of Technology on February 23 of this year by Niles Poulson, Esq., of this city. At the close of the paper are comments relating to the work Mr. Poulson has done in the direction indicated, and calling attention to the house which he erected a few years since at Bay Ridge, L. I. You say that, "apart from the method of constructing the skeleton of this building, it is one of the most interesting in America, and has acquired a world-wide reputation through the accounts of it, incomplete and generally incorrect, that have been published in the technical journals of many countries. As yet a complete and reliable description of the building has not been published." We think the last sentence quoted is apt to prove misleading, as the statement is somewhat at variance with the facts in the case. In this connection, we desire to call your attention to the issue of *Carpentry and Building* for December, 1891, a copy of which we have pleasure in forwarding you by this mail. In it you will find a full description of the house in question, together with the methods of floor-construction advocated by Mr. Poulson, and illustrated by some sixteen engravings showing interior views of the house, and other features of interest in connection therewith. The drawings from which these engravings were made were furnished by Mr. Poulson, as was also the data on which the descriptive article was based. We think a perusal of this article in connection with the illustrations presented will enable one to form a very good idea of the manner in which the house is built and the features incorporated, to which Mr. Poulson invites special attention.

Yours truly, Editor *Carpentry and Building.*

[We can only plead in extenuation of our misstatement a forgetfulness which was, for the moment, apparently shared by Mr. Poulson himself. A glance at the issue of *Carpentry and Building* also enables us to say that the house in question was built after the designs of Mr. J. M. Farnsworth. — Eds. American Architect.]

NOTES AND CLIPPINGS

The Ferris Wheel. — The Bethlehem Iron Company shipped to the World's Fair yesterday the largest piece of steel ever forged in this country. It is thirty-three inches in diameter, forty-five feet two inches long and weighs 89,320 pounds. This shaft will be used as the axle of the great Ferris wheel, 250 feet in diameter. It is the invention of G. W. G. Ferris, of Pittsburgh. The prototype of this wheel is the large buggy-carrying wheel, about fifty feet high, at Coney Island. The Ferris wheel will be 264 feet high. Suspended around it will be thirty-six cars, with a capacity of sixty passengers each. The entire structure is of steel, and somewhat resembles a huge bicycle-wheel revolving perpendicularly between two steel towers. The passengers, while enjoying their novel ride, will be as safe as while riding in a railroad train. Arrayed in groups on the rods around the crown of the wheel will be 3,000 incandescent lights of various colors, which will alternately be extinguished and relighted as the wheel revolves. To run this wheel there will be two link-motion reversible engines of 2,000 horse-power. The Bethlehem Iron Company this morning sent a heavy shipment of armor-plates to San Francisco for the United States battle-ship, Oregon, composed of four plates of diagonal armor. Two of the plates weighed twenty-two tons apiece and the other two about twenty-seven tons each. The rest of the Oregon's diagonal plates, about 120 tons, will leave the works next week. — *N. Y. Tribune.*

Chimney Accidents. — Two more mill-chimneys have collapsed, one on Thursday, last week, at St. Helen's, and another on Saturday evening at Widnes. The former is said to have been over 300 feet high, and to have collapsed right to the foundations, — one man being injured and damage estimated at £8,000 being done to property. The one at Widnes was only 90 feet high, and was being repaired at the time the upper part of the chimney gave way, two men being killed. Both chimneys appertained to chemical works, and in both, apparently, the brickwork had been eaten into by the acids and gases emitted from the works. Here, at any rate, there seems to be an ascertainable cause for the disasters. It is to be hoped that inquiries into the two cases will settle this point beyond dispute, namely, Is ordinary brickwork gradually destroyed by the fumes from chemical works; and if so, how soon? Architects and engineers would then know whether some other material than brickwork must be used in such a situation, and the owners of brick chimneys might perhaps be induced (or compelled) to make periodical inspections of them from base to coping to ascertain their condition. It is certainly not creditable to the owners of chimneys, or to their architects or engineers, that there should be so many failures in this class of work. — *The Builder.*

The Esplanade of the Invalides, Paris. — Another innovation is at the present moment causing much sorrow to the aged and decrepit ex-defenders of France, who for so many years have enjoyed their daily strolls on the Esplanade des Invalides. An edict has just gone forth to the effect that a huge railway-station, which is eventually destined to replace the Gare Montparnasse, is to be constructed on the Esplanade des Invalides, this splendid and historic piece of ground, which extends before the superb retreat built by Louis XIV for brave old soldiers. It seems like a downright sacrilege, and also like a useless cruelty, thus to cut off this parade-ground, where the sun shines so gayly through the emerald leaves of the great chestnut-trees; and it is sad to think of the poor old veterans who, in the future, when they stand near their beloved "Batterie Triomphante," will miss so severely the lovely vista of verdure and blue sky which is about to be destroyed in order to erect a sooty, noisy, foul-smelling railway-station. This decision on the part of the Government has aroused violent protests from different quarters, but remonstrance has been of no avail, and the Esplanade is doomed. — *New York Tribune.*

TRADE SURVEYS

The recent court-decisions where railway strikers were concerned opens up a question which, no matter how it may be decided now, will lead to agitations of no small significance to employers and employés. The issues raised by these decisions relate to fundamentals, and a great many things they do not touch will come up for consideration before any court-decision will be accepted as final. It does not decide anything to say that one employé or a thousand employés can quit work, and that they have a right to persuade others to not accept employment or to quit work. Rights and duties are now extremely complex. The growth of modern society and of industrial organization and the growth and concentrating tendency of capital have all helped to render a clear definition of the rights of labor less easy of solution or adjustment than before these complex conditions existed. Laborers look through different spectacles from judges. Certain conclusions have been reached by organized labor in this country which, if combated by adverse legislation or denounced by judicial opinions or decrees, would give rise to fresh agitations for the better preservation of the liberty of the wage-worker. Employers are more familiar with this bed-rock determination of organized labor than court-judges. The point involved in this statement is: The power of organized capital has grown enormously; the power of organized labor must grow correspondingly, and be correspondingly recognized in its dealings with employers. When issue is joined, it will be on this point. The courts recognize no such claim or right or inference. Labor will demand it. Clashings must inevitably come because of the assumptions of labor, though they are seldom written in the by-laws. Agitations for the betterment of the condition of industrial society, if the phrase is permissible, are in Great Britain and Europe far in advance of movements here. The insurance question, especially in Europe, has reached an interesting phase, but some time will elapse before insurance of employés will become established as a harmonious system. The work done, especially in Germany, is instructive. The laws there govern or have reference to sickness, accidents and old age. In a population of fifty million persons there are 12,500,000 workmen. Of these, 7,723,000 are insured, at a cost of fourteen shillings per annum, against sickness, three shillings against accident, and nine shillings against old age. The total receipts from the three classes is about seventy-five million dollars, of which employers contribute about half. Other countries are following in the footsteps of Germany, and considerable progress is being made in establishing a working system of insurance against sickness and accidents and for old age. The best talent is employed, and the greatest care is taken to build-up the system. Congresses are held, at which notes are compared and discussions had. That the principle of insurance has taken a deep and lasting root needs no saying. Whether it will ever be adopted on this side is another question. Probably not in the shape it has taken in Europe. In Great Britain, the labor-question has taken a more annoying shape, viz, that of defiant and aggressive trades-unionism. The latest achievement of organized labor there is seen in the establishment of an active Department of Labor, which is primarily to gather statistics and be a reservoir for the accumulation of all material that might be of use for the further advancement of labor interests. The spirit of trades-unionism has grown under successive defeats, and is a stronger factor in England than it ever was. It has exhausted all there was in distributive coöperation, and is now entering the political arena, well equipped, and with organization extending into every hamlet and the kingdom where toilers toil. The tone of the industrial press reveals the concern felt over what this organization of labor may effect by persistent and consistent effort. Its sympathies are with the shop rather than the farm, and it calls for cheap bread rather than high-priced English-grown agricultural products. The growth of this new factor means or threatens radical changes in government economic policies. On this side there is little to be apprehensive about. While British workmen are vigorously contesting for an eight-hour day our wage-workers are quiet, paying no attention to the possible benefits of distributive coöperation, political action or even aggressive trades-unionism. Our wage-workers are rather on the defensive, seeking fleeting benefits from Chinese exclusion acts and restricted immigration. Wages are stationary in nearly all lines, and will probably remain so. While employers in some lines are suspicious of strikes, it is not probable that there will be any general or concerted movement in that direction. All industries are in healthy condition. Manufacturers study requirements more closely. Accumulations are practically impossible. Competition is restoring harmony on one hand, and restraining enterprise on the other. New work is coming up on all sides. House and factory building of a volume equal to last year is assured. Under the improving prospects, a slight hardening tendency in prices is observable all along the line. Builders are full of confidence and contracts. Architects have gathered up a great deal of work. Promoters are industriously at work on new enterprises. Rapid transit in cities and towns is absorbing attention, and enterprise and capital. New avenues of activity are opening, and the opportunities for activity are multiplying on every hand.

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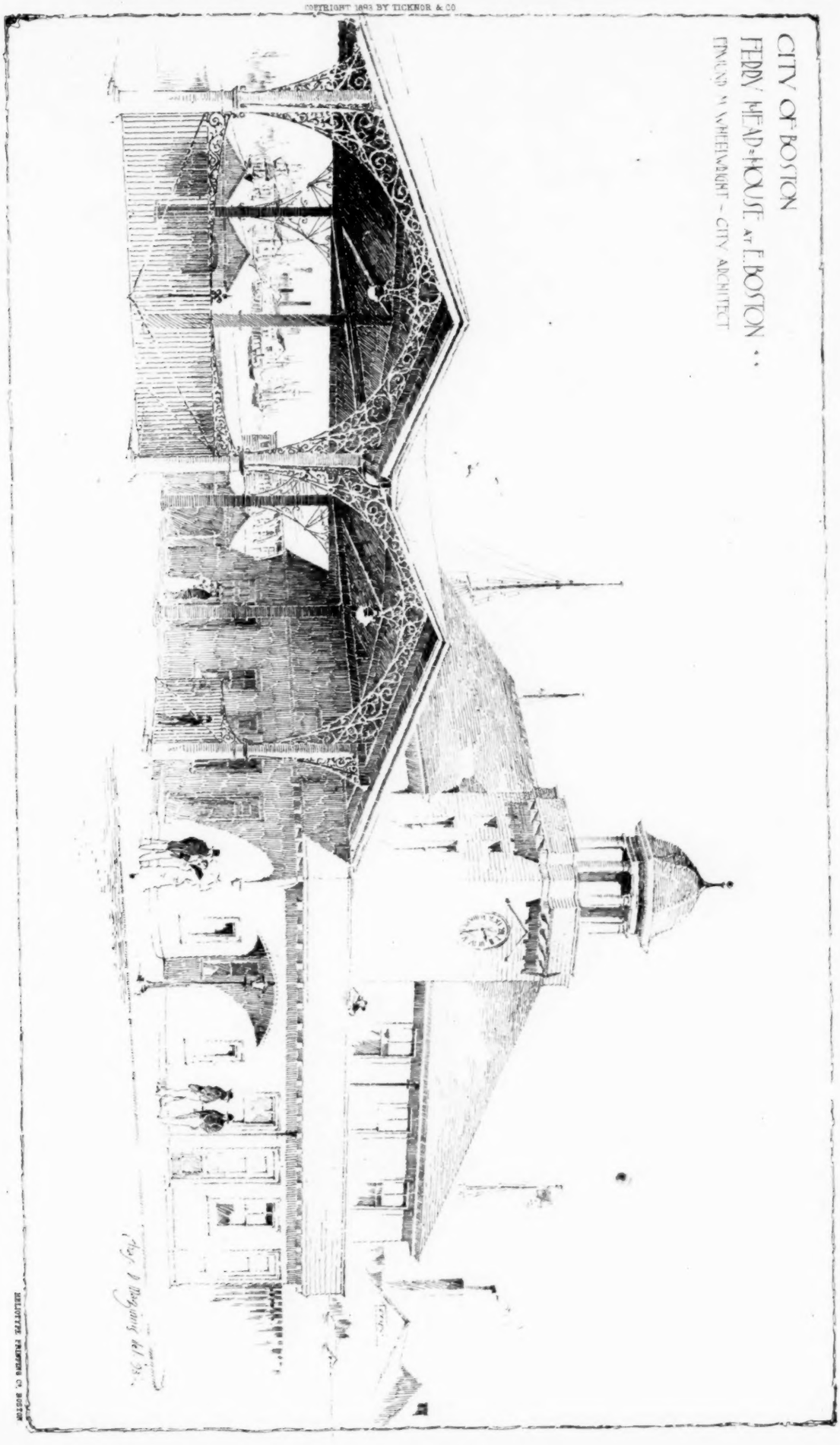

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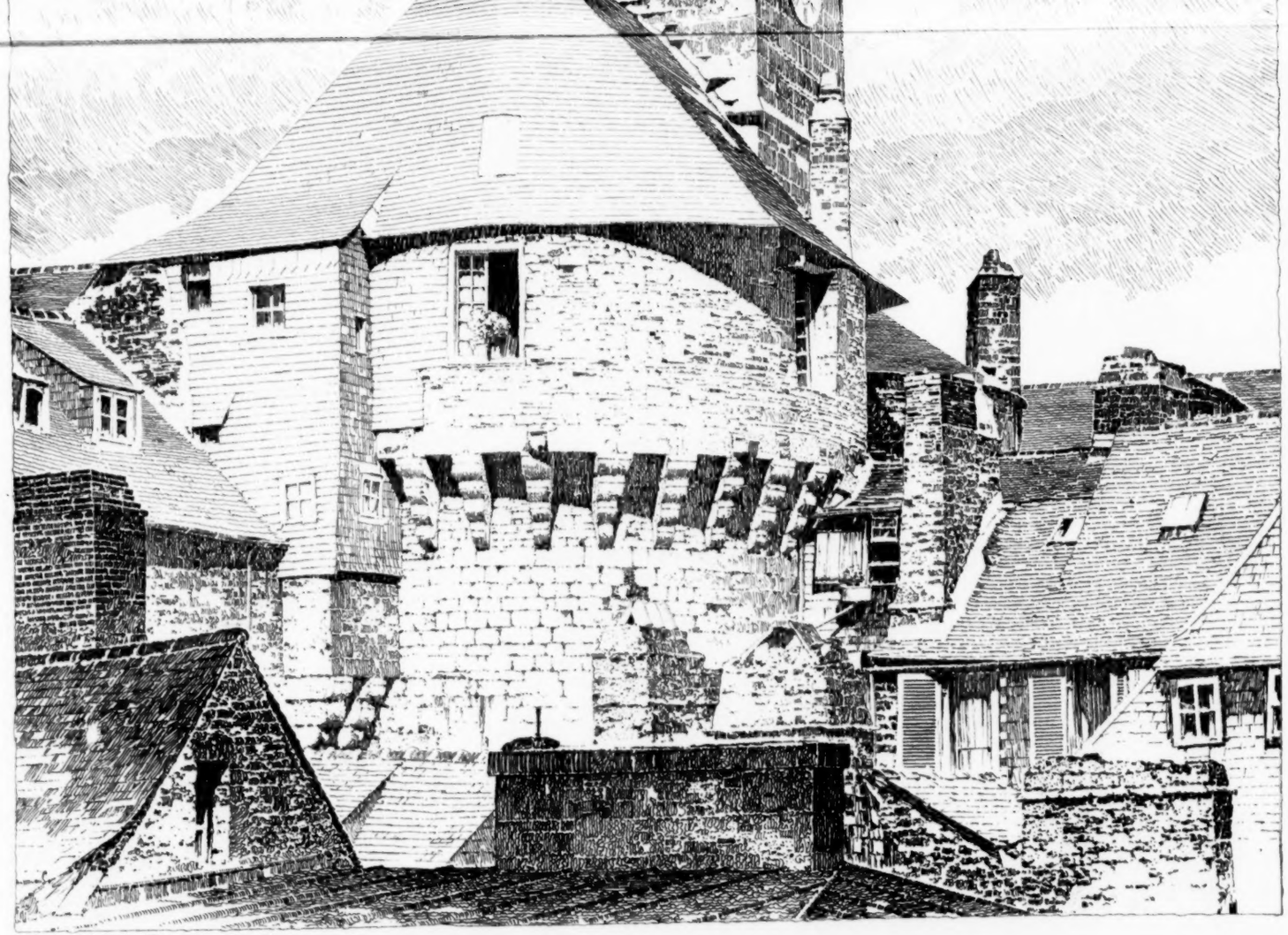

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